



Service Manual

StringPin Pinsetter

Ten Pin

April 2014 / 55-900001-000

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CUSTOMER SERVICE
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StringPin Pinsetter Service Manual

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Overview	

Section 1 - SAFETY!

NOTES & WARNINGS

Throughout this publication, “Warnings”, and “Cautions” (accompanied by one of the International HAZARD Symbols) are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. They are defined below. OBSERVE AND READ THEM CAREFULLY!

These “Safety Alerts” alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus training and “Common Sense” operation are major accident prevention measures.



NOTE or IMPORTANT!: Will designate significant informational notes.



WARNING! Will designate a mechanical or nonelectrical alert which could potentially cause personal injury or death.



WARNING! Will designate electrical alerts which could potentially cause personal injury or death.



CAUTION! Will designate an alert which could potentially cause product damage.



Will designate grounding alerts.

SAFETY NOTICE TO USERS OF THIS MANUAL

This manual has been written and published by the Service Department of Brunswick Bowling and Billiards to aid the reader when servicing or installing the products described.

It is assumed that these personnel are familiar with, and have been trained in, the servicing or installation procedures of these products, which includes the use of common mechanic's hand tools and any special Brunswick or recommended tools from other suppliers.

We could not possibly know of and advise the reader of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not attempted any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by Brunswick, must first completely satisfy himself that neither his nor the product's safety will be endangered by the service procedure selected.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

It should be kept in mind, while working on the product, that the electrical system is capable of violent and damaging short circuits or severe electrical shocks. When performing any work where electrical terminals could possibly be grounded or touched by the mechanic, the power to the product should be disconnected prior to servicing and remain disconnected until servicing is complete.

SAFETY REQUIREMENTS FOR STRING PIN PINSETTERS

As with all machinery, a certain amount of risk is involved in working on the String Pin Pinsetter. However, if the necessary care, knowledge and responsibility are exercised, damage to the pinsetter and people involved in accidents can be avoided. The following steps should be taken:

Safety Guidelines

1. **ONLY PROPERLY TRAINED PEOPLE ARE QUALIFIED TO WORK ON OR OPERATE THE PINSETTER.**
2. Never bypass, disable, or tamper with the safety interlocks or pinsetter function switches.
3. Always face toward the machine when using the ladder to climb onto or off the machine. Only one person should be on the ladder at any time.
4. Suitable clothing must be worn (for example: rubber-soled shoes). Do not wear loose clothing such as neckties or smocks that could get caught in moving parts. Remove rings, watches, earrings, bracelets and other jewelry to avoid injury.
5. Care should be taken while near the front of the machine. Accidentally blocking the photocell beam will cause the pinsetter to cycle.
6. Always turn the Pinsetter off before working on the machine.
7. If more than one person is working on a machine or if a stop/run switch will be out of reach while working on the machine, lockout the controller power switch to prevent a person from turning on the pinsetter before the other person says he/she is clear of the pinsetter.
8. Fire extinguishers must be on hand and maintained properly. Keep oily rags and other combustibles in approved fire proof containers.
9. If more than one person is working on a machine, be sure the other person is CLEAR before restarting the machine.
10. When working in the pinsetter area while machines are in operation, ear protection should be worn.
11. Never work on or around the pinsetter while under the influence of alcohol, drugs, or any other substance that can impair your physical abilities or mental judgment.
12. Always use the correct tools for the job.
13. Poisonous or toxic cleaners must not be used. Always check the material safety data sheets before using new cleaners.
14. Always use factory approved parts when repairing the pinsetter. Using substandard parts may pose a safety risk.

Section 2 - Overview

This manual is designed to help you service, repair, and perform preventive maintenance on your pinsetters in a safe and efficient manner. Prior to working on one of these pinsetters, you should read the safety information and be familiar with the Safety Requirements located at the beginning of the manual. This manual also provides troubleshooting guidelines that will help reduce downtime and can be used to provide years of reliable operation of your pinsetters.

OPERATION AND CYCLES

Turning the Pinsetter On/Off

The pinsetter can be turned off using the Stop/Run switch located at the back or front of the machine or the main power switch located on the StringPin Control box. **Always turn the Pinsetter off before working on the machine.** If internal service work is to be performed, turn off the main power switch and use an approved lockout device on the main power switch to prohibit the machine from being turned on. Refer to Figure 2-1

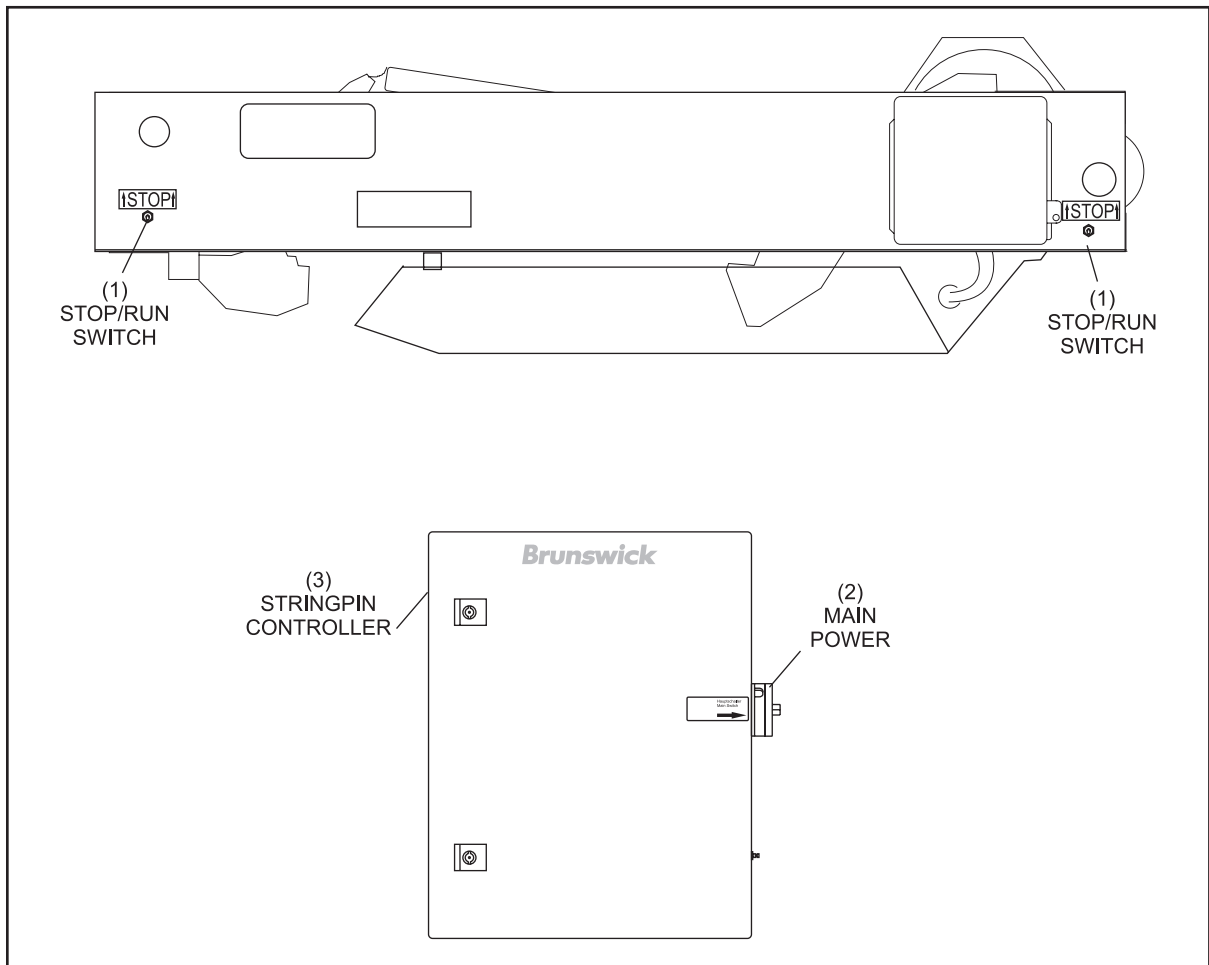


Figure 2-1 Pinsetter On/Off Control

(1) STOP/RUN SWITCH

(2) MAIN POWER

(3) STRINGPIN CONTROLLER

Actions That Start a Machine Cycle

Any of the following occurrences will cycle the pinsetter.

1. Pushing the reset button on the ball rack.
2. The pulling of a string attached to a pin such as when a bowling ball knocking over one or more pins.
3. The second ball in a frame breaking the pinsetter ball detector.
4. Switching the main power located on the StringPin Controller to the “On” position.
5. The scoring system sending the pinsetter a “Reset” command through its communication cable.

Description of Pinsetter Cycles During Bowling

First Ball Cycles

Strike

Three seconds after the first pin falls, all ten pins are raised to the full up position and ten new pins are lowered to the pindeck.

Gutter Ball

The machine will receive and remember the ball detect signal. There is no machine activity and after five seconds the machine is ready for the second ball.

Some Pins Knocked Down (Standing Pin Cycle)

Three seconds after the first pin falls, all ten pins are raised to the full up position and those that were left standing will be lowered to the pindeck.

Second Ball Cycles

Three seconds after receiving a ball detector signal all pins are raised to the full up position and ten new pins are lowered to the pindeck.

MACHINE COMPONENT LOCATION AND DESCRIPTION

The simple design of the StringPin pinsetter makes it easy and inexpensive to operate and maintain. Because the pins are tethered to the machine by the “strings”, only 10 pins are required rather than the 20 - 23 pins typically used in free fall pinsetters. The design also eliminates the need for additional components required to collect pins and move them through the machine. This reduces the noise and pin handling issues associated with free fall pinsetters.

The StringPin Pinsetter consists of four subassemblies:

- Main Frame
- Pin Table (Centering Cones)
- Ball Pit (Ball Stop, Pit Curtain, Pit Carpet)
- Ball Accelerator

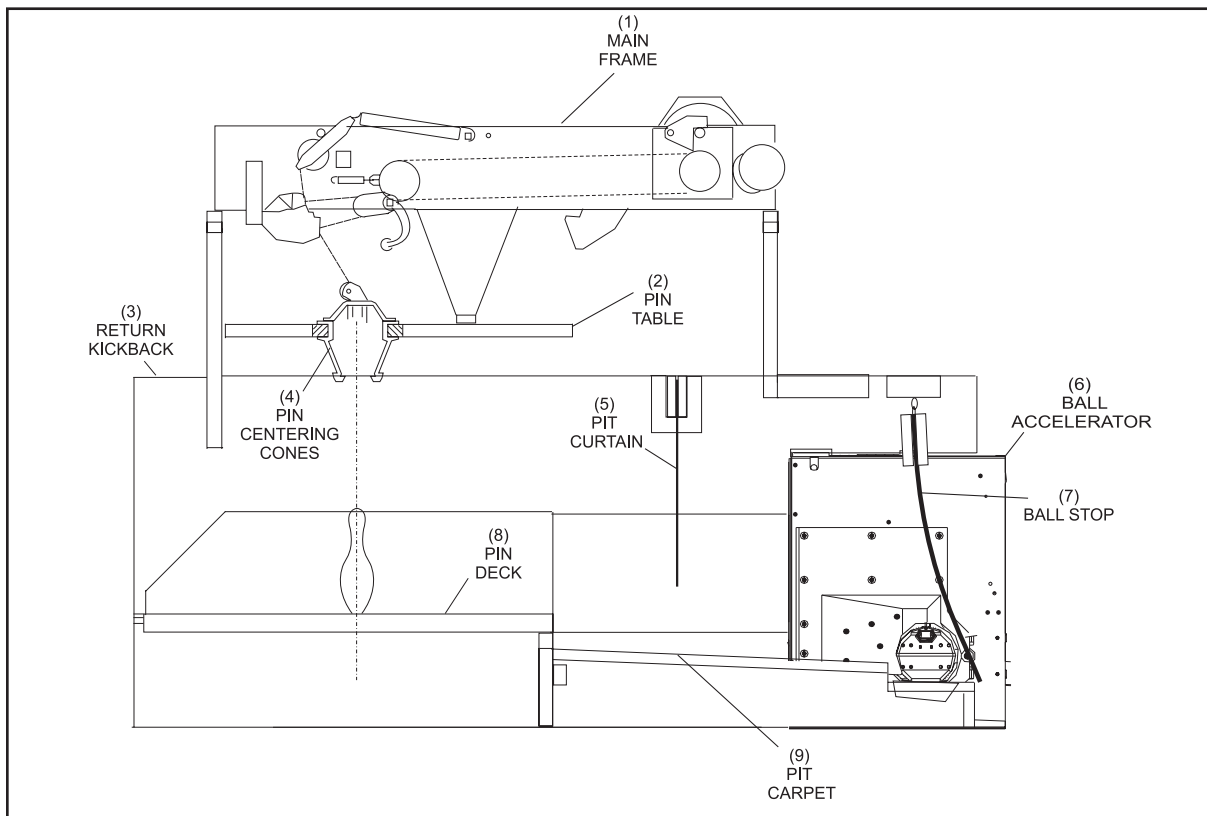


Figure 2-2. String Pinsetter Main Components - Side View

- | | | |
|-------------------------|-----------------|----------------------|
| (1) MAIN FRAME | (2) PIN TABLE | (3) RETURN KICKBACK |
| (4) PIN CENTERING CONES | (5) PIT CURTAIN | (6) BALL ACCELERATOR |
| (7) BALL STOP | (8) PIN DECK | (9) PIT CARPET |

Main Frame

The Main Frame contains the major components that make the pinsetter function. The main frame is made up of the following components:

1. String Spool and Tension Lever Assembly
2. String Wagon and Drive Assembly
3. String Pinsetter Interface Control (SPIC)

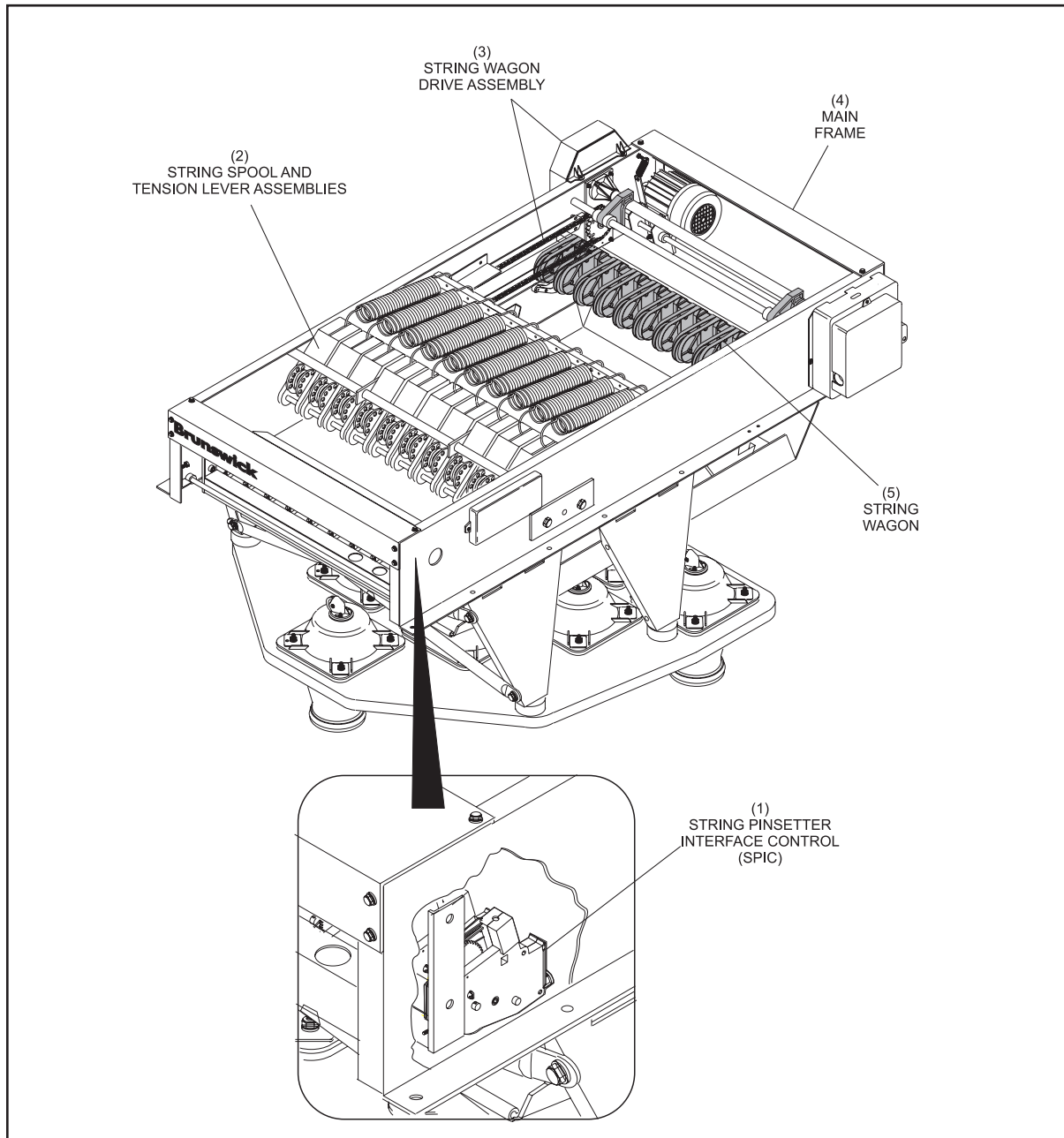


Figure 2-3. Main Frame - Components

- | | | |
|---|---|---------------------------------|
| (1) STRING PINSETTER INTERFACE CONTROL (SPIC) | (2) STRING SPOOL AND TENSION LEVER ASSEMBLIES | (3) STRING WAGON DRIVE ASSEMBLY |
| (4) MAIN FRAME | (5) STRING WAGON | |

The String Spool and Tension Lever assembly is the starting point for a string. From the spool the string routes through the String Wagon. The wagon moves back and forth in the main frame to lower or raise the pins. From the wagon, the string continues through the String Pinsetter Interface Control (SPIC). The SPIC contains a switch that detects when a pin has been knock over and a string brake that controls whether the pin will be lowered to the pindeck when the string wagon moves toward the front of the machine. Finally the string routes through a centering cone before it is tied to the pin.

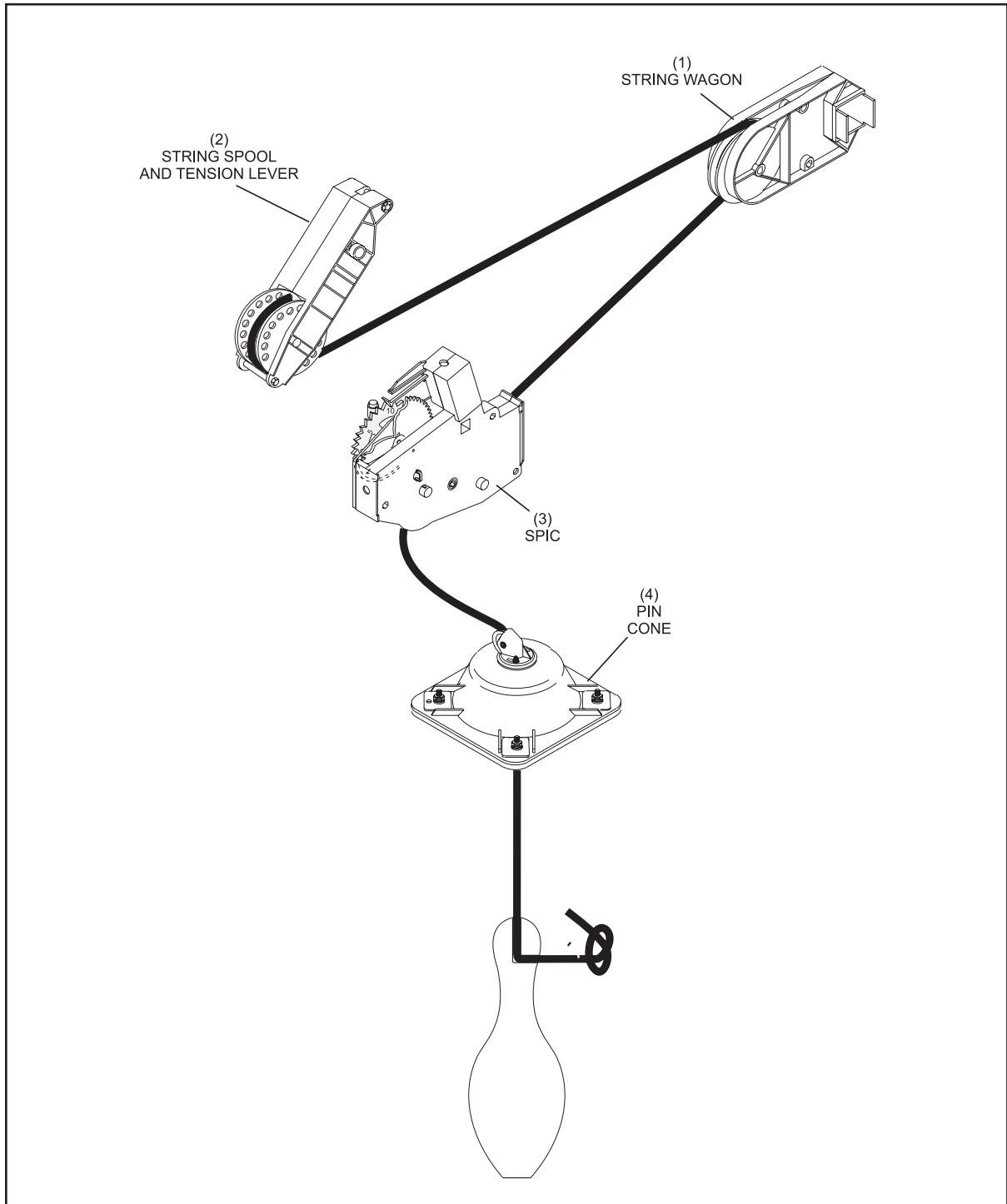


Figure 2-4. Main Frame - String Path

(1) STRING WAGON
(4) PIN CONE

(2) STRING SPOOL AND
TENSION LEVER
ASSEMBLIES

(3) SPIC

String Spool and Tension Lever Assembly

The String Spool and Tension Lever assembly is the starting point for the strings. When new, there is 16'5" (5004mm) length of string attached to each pin. A portion of this string is used during normal machine operation. The rest is wound around the String Spool and is considered spare string that can be used to repair worn-out or damaged sections of the string that is in use.

The String Spool is mounted on a spring loaded Tension Lever. The lever keeps the strings from being stretched due to excessive force as the pins are lifted into the centering cones of the pin table. Holes in the String Spool reel allow the user to control the length of string in use during normal operation and control the amount of tension applied to the string. Because the strings will stretch over time, it is important to check the string tension regularly to ensure that the machine functions properly.

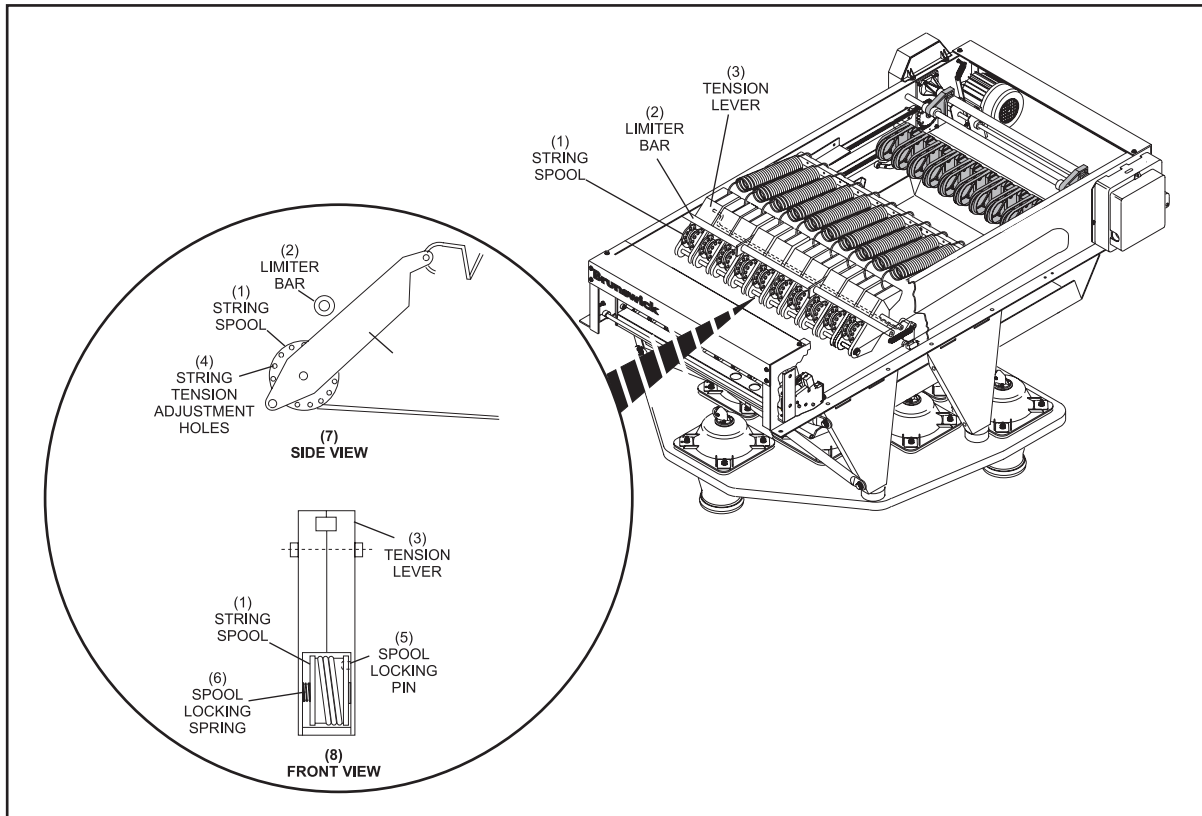


Figure 2-5. String Tension Adjustments

- | | | |
|--|-----------------------|--------------------------|
| (1) STRING SPOOL | (2) LIMITER BAR | (3) TENSION LEVER |
| (4) SPRING TENSION
ADJUSTMENT HOLES | (5) SPOOL LOCKING PIN | (6) SPOOL LOCKING SPRING |
| (7) SIDE VIEW | (8) FRONT VIEW | |

String Wagon And Drive Assembly

The String Wagon moves back and forth in the main frame to lower or raise the pins and to lift and lower the gate. The wagon is driven clockwise using a chain attached to the Motor and Gear Assembly. Fins mounted inside the main frame guide the strings front to back keeping them separated so they don't interfere with each other.

When going toward the front of the machine (Home Position), the strings are let out to allow pins to lower to the pindeck. Adjustable brackets called Slow Setting Pin brackets ensure that the pins are set smoothly on the pindeck. Whether the pin is actually lowered is determined by a string brake located in the StringPin Interface Control (SPIC).

As the wagon returns to the rear of the machine, the strings are pulled back causing the pins to lift into the centering cones located on the pin table.

If pins are unable to lift into the center cones due to a string tangle, the added tension on the strings trigger a De-tangling Bar and Switch. The machine will attempt to untangle the strings by continually turning the drive motor off, then on, to create a up/down shaking motion of the pins.

Switches inside the Cam and Switch Cluster assembly are used to monitor the location of the string wagon.

Stop Dogs hold the sweep wagon at the back of the machine in the "pins up" position. Although they are not used during normal machine operation, the blocks are needed to prevent the weight of the pins from pulling the wagon to the front of the machine after the "Pins Up" switch is pressed. Having the wagon held in this position is useful when performing maintenance functions such as string tensioning.

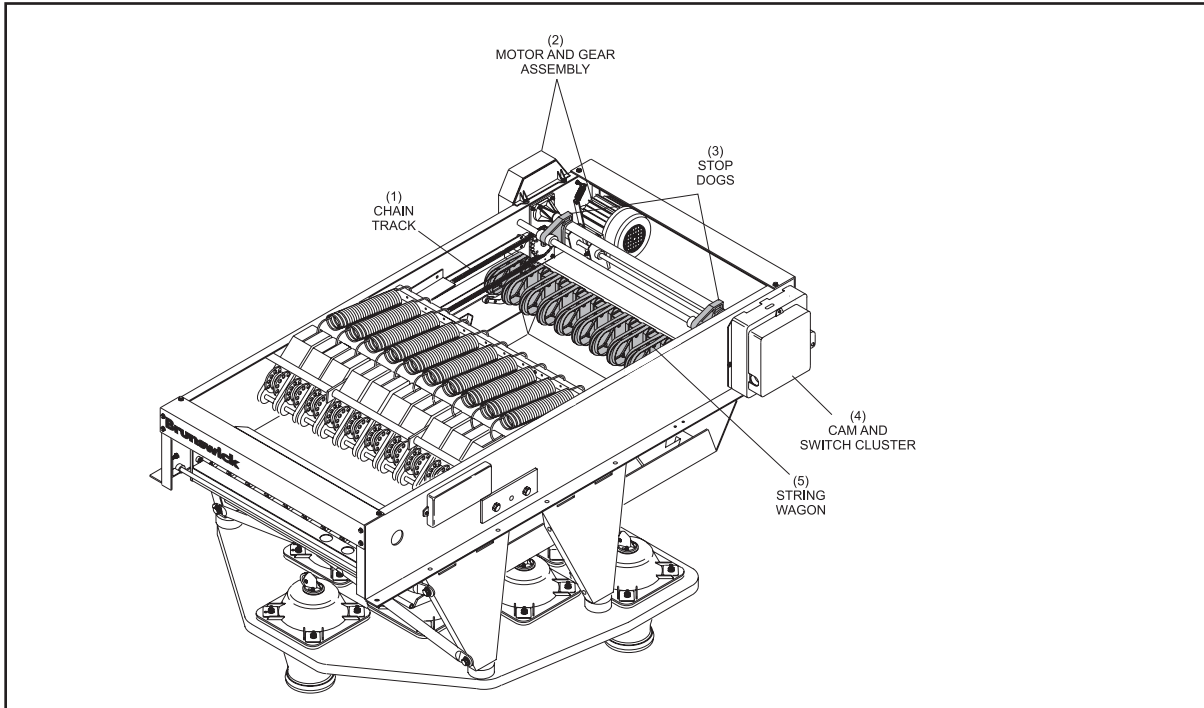


Figure 2-6. String Wagon Drive Components

- | | | |
|----------------------------|-----------------------------|--------------------------|
| (1) CHAIN TRACK | (2) MOTOR AND GEAR ASSEMBLY | (3) STOP DOGS |
| (4) CAM AND SWITCH CLUSTER | (5) STRING WAGON | (6) CHAIN TENSION SPRING |

Drive Shaft and Switch Cluster

The pinsetter uses a 3-phase motor and V-belt to run the string wagon drive gear and shaft. A cam and switch cluster located at the opposite end of the drive shaft determines the location of the string wagon by monitoring the rotation of the shaft. String guide fins mounted to the bottom of the frame keep the strings separated to ensure they do not tangle or interfere with each other.

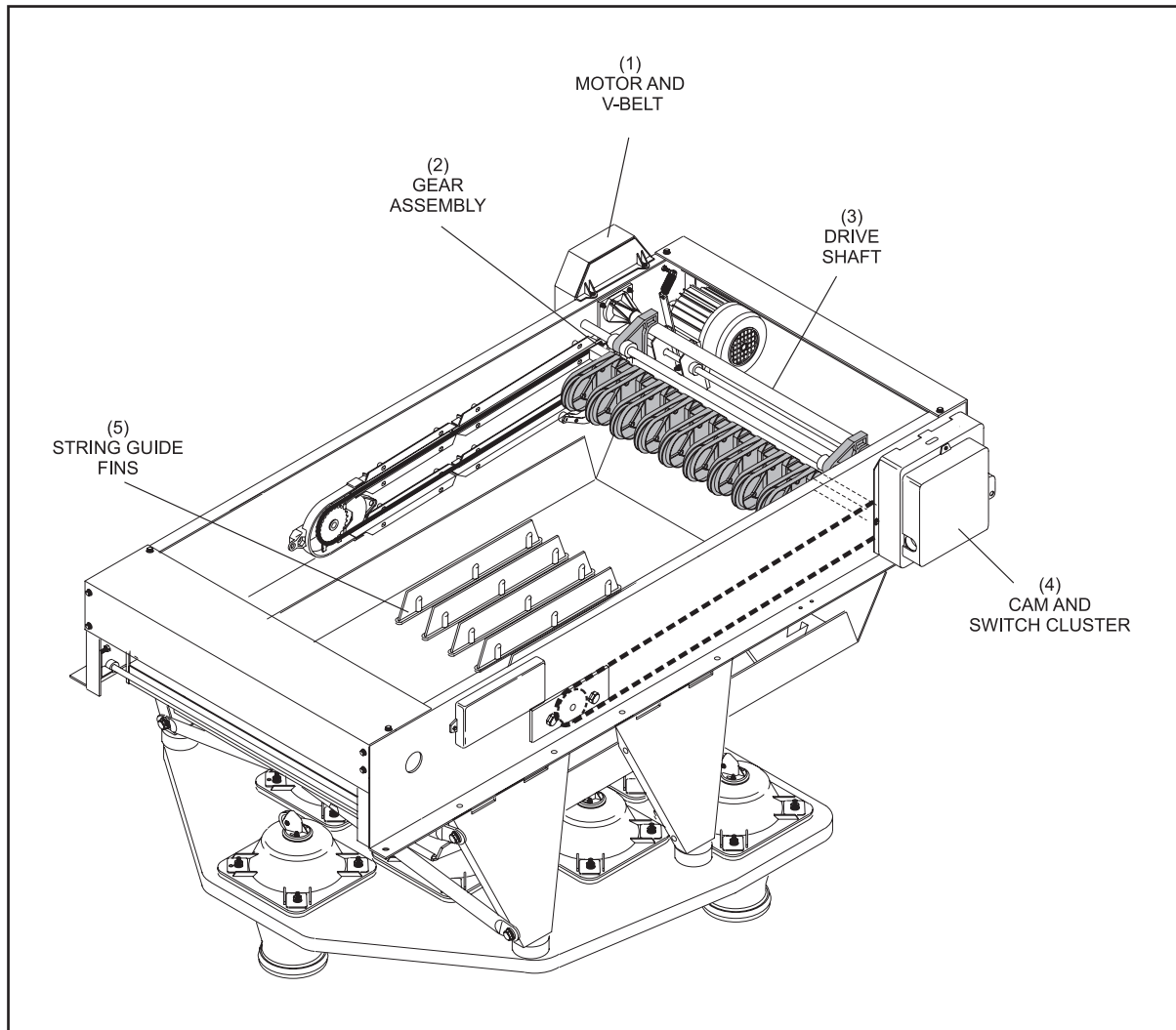


Figure 2-7. String Wagon Drive

(1) MOTOR AND V-BELT
(4) SWITCH CLUSTER

(2) GEAR ASSEMBLY
(5) STRING GUIDE FINS

(3) DRIVE SHAFT

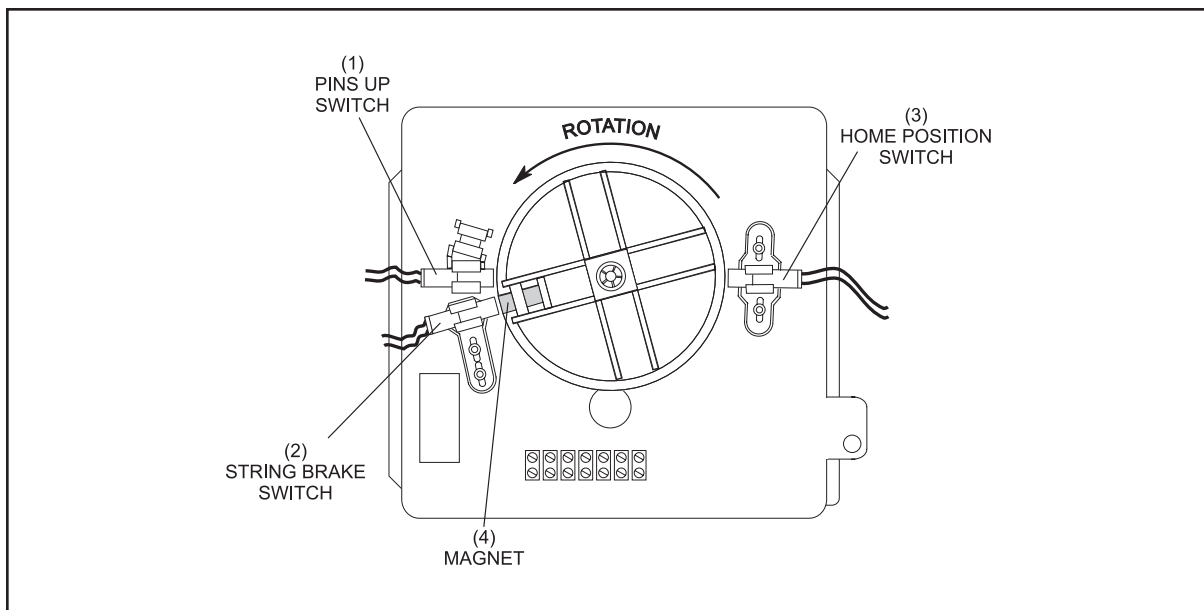


Figure 2-8. Switch Cluster

- | | | |
|--------------------|-------------------------|--------------------------|
| (1) PINS UP SWITCH | (2) STRING BRAKE SWITCH | (3) HOME POSITION SWITCH |
| (4) MAGNET | | |

The switches in the cluster include:

1. Pins Up Switch - This switch indicates when the string wagon is at the back of the machine and the pins are in the “up” position.
2. String Brake Switch - This switch is used after pins have been knocked over on a first ball delivery. In operation, after the string wagon has passed the pins up position, this switch causes the string brake solenoids inside the SPIC (StringPin Pinsetter Interface Control) for those pins that were knocked over to energize. This keeps the pins from lowering onto the pindeck as the wagon travels toward the front of the machine.
3. Home Position Switch - This switch indicates when the string wagon is at the front of the machine and the pins are standing on the pindeck. This switch causes the motor to shut off after the pins are placed on the pindeck.

Slow Setting Pin Bracket

The function of the slow setting pin bracket is to slow down the speed at which the pins are moving as they are being set on the pindeck. There is one of these brackets on each side of the frame. In operation, the brackets interact with pivot rollers attached to each side of the string wagon drive chain causing string wagon to tilt downward. This motion slows the decent rate of pins to allow them to be gently placed on the pindeck. The tipping motion of the wagon also assists in positioning the stings within their guide fins. Refer to *Figure 2-9*.

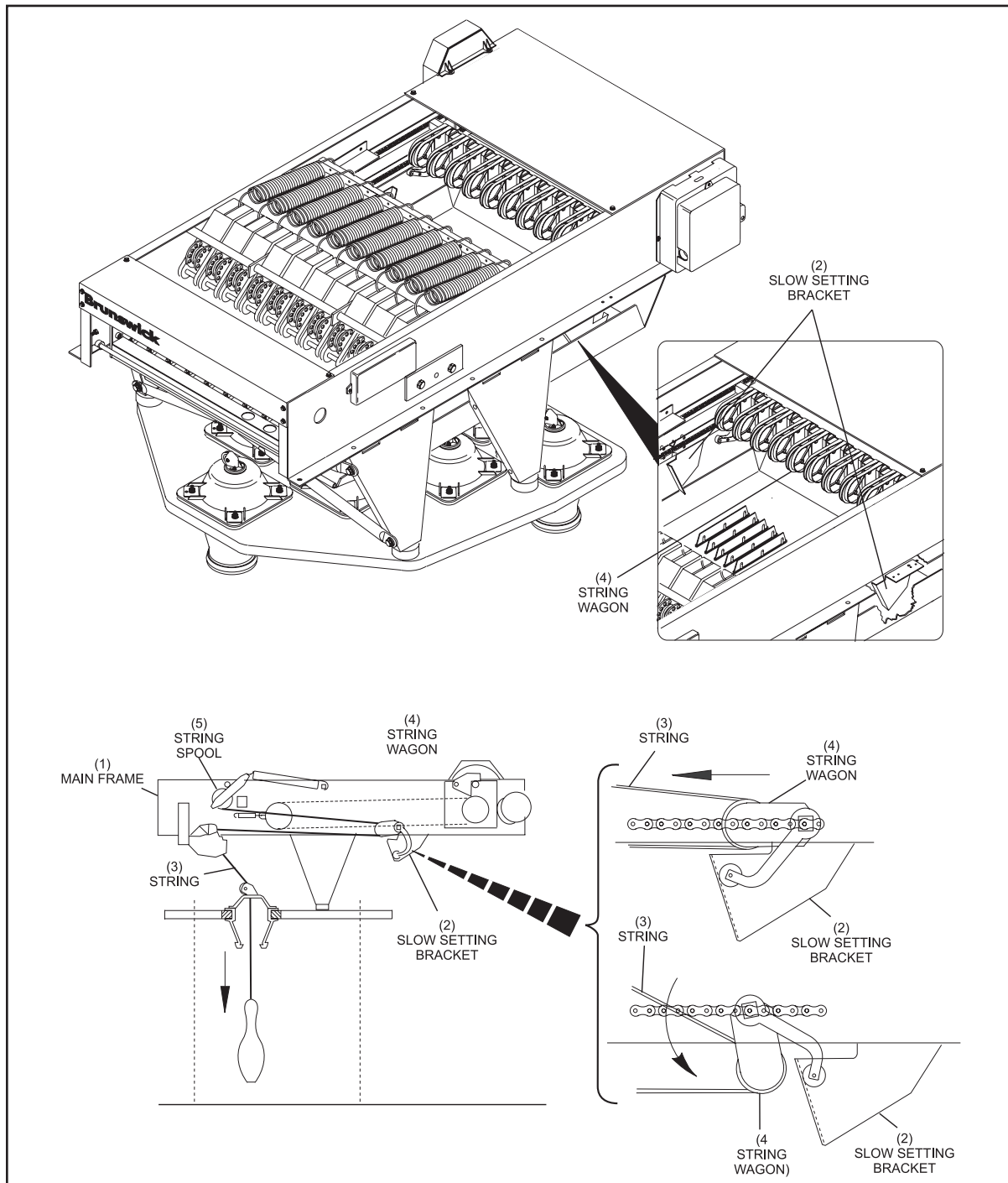


Figure 2-9. Slow Setting Pin Bracket

- | | | |
|------------------|--------------------------|------------|
| (1) MAIN FRAME | (2) SLOW SETTING BRACKET | (3) STRING |
| (4) STRING WAGON | (5) STRING SPOOL | |

De-tangling Bar and Switch

If the string of two or more pins become tangled as the pins are being raised, additional string pressure is put on the tension lever assemblies causing them to lift the de--tangling bar. This action rotates the cam located on the end of the bar to disengage it from the de-tangle switch. The machine enters a de-tangle sequence in an attempt to remedy the problem by using the drive motor to create an up and down motion of the pins.

During the de-tangle sequence, the drive motor will shut off to release the string tension and allow gravity to lower the pins towards the pindeck. After two seconds, the motor turns back on to raise the pins. If a tangle is still present it will again be detected by the de-tangle switch and the motor will shut off for another two seconds. After five failed attempts to correct the problem, the motor will shut off for five seconds to allow additional time for the pins to lower to the pindeck. This 2, 2, 2, 2, 2, 5 second shaking pattern will continue until the strings are no longer tangled or a service person turns off the machine and manually corrects the problem. Refer to *Figure 2-10*.

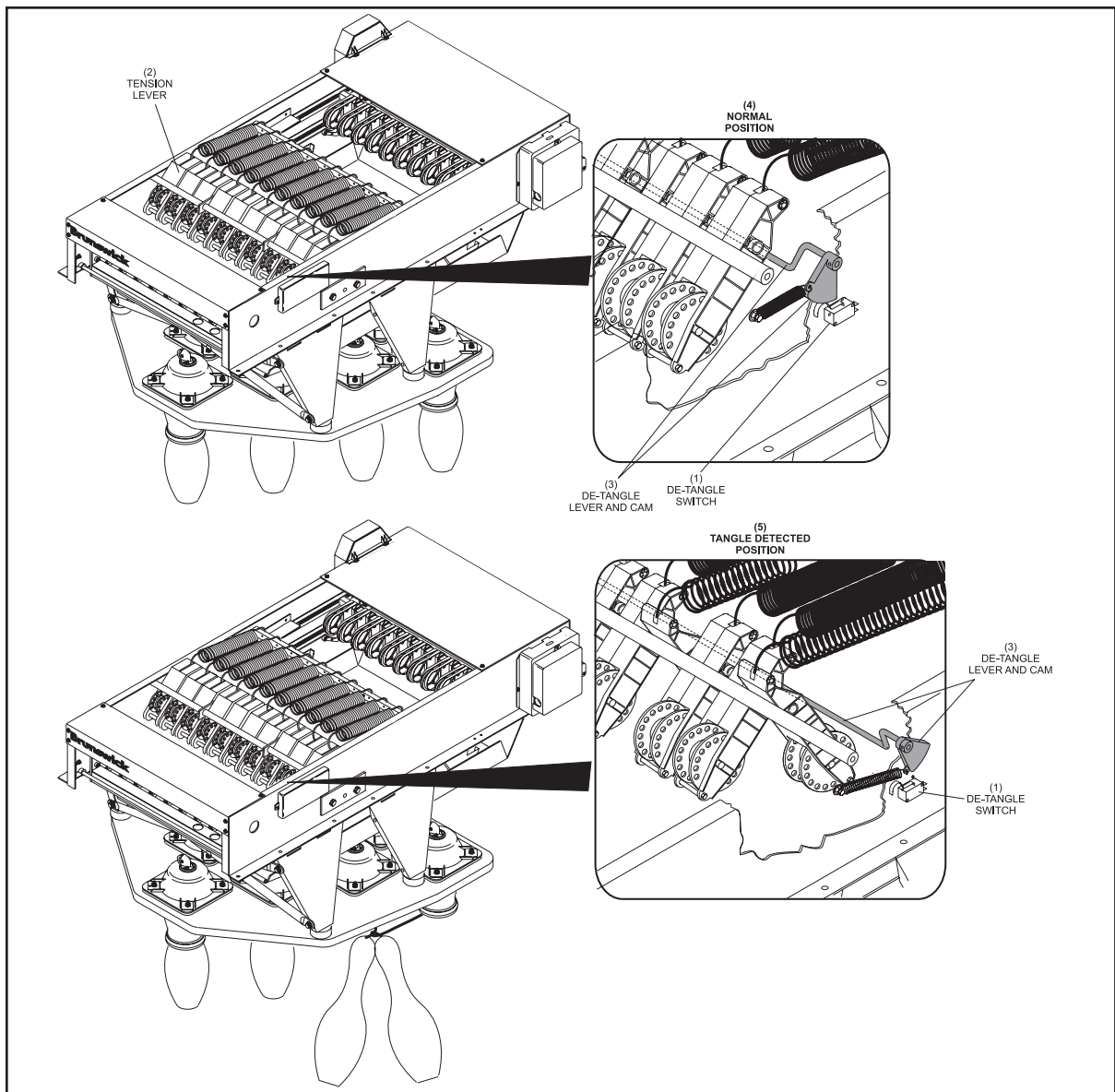


Figure 2-10. De-tangle Switch Activation

- (1) DE-TANGLE SWITCH
- (4) NORMAL POSITION

- (2) TENSION LEVER
- (5) TANGLE DETECTED POSITION

- (3) DE-TANGLE LEVER AND CAM

StringPin Pinsetter Interface Control (SPIC)

The SPIC is the final main frame component a string passes through before being routed to the pin table and pin. The SPIC serves two main functions for the pinsetter.

1. Detects when a pin has been knock over.
2. Controls whether the pin will be lowered to the pindeck when the string wagon moves toward the front of the machine.

When a pin is knock over, the pulling of the string causes a pulley and gear, referred to as a string roller and string gear, to rotate. If the string pulls with enough force, a magnet, attached to the string gear through a friction clutch, rotates to actuate a reed type switch. A pinfall sensitivity adjustment on the SPIC determines the amount of string pull force needed, by controlling the distance the magnet must rotate to actuate the switch.

The second function of the SPIC controls whether the pin is allowed to lower to the pindeck. In normal operation the string is allowed to move freely through the SPIC allowing the pin to lower to the pindeck. Energizing a solenoid in the SPIC causes a string brake to pinch the string prohibiting it from passing through the SPIC.

Each of the ten string control assembly consists of the following components: Refer to *Figure 2-11*.

- Solenoid to operate the string brake
- String Brake
- Pinfall Switch
- Magnet
- Friction Clutch Gear
- String Roller
- Pinfall Sensitivity Adjustment

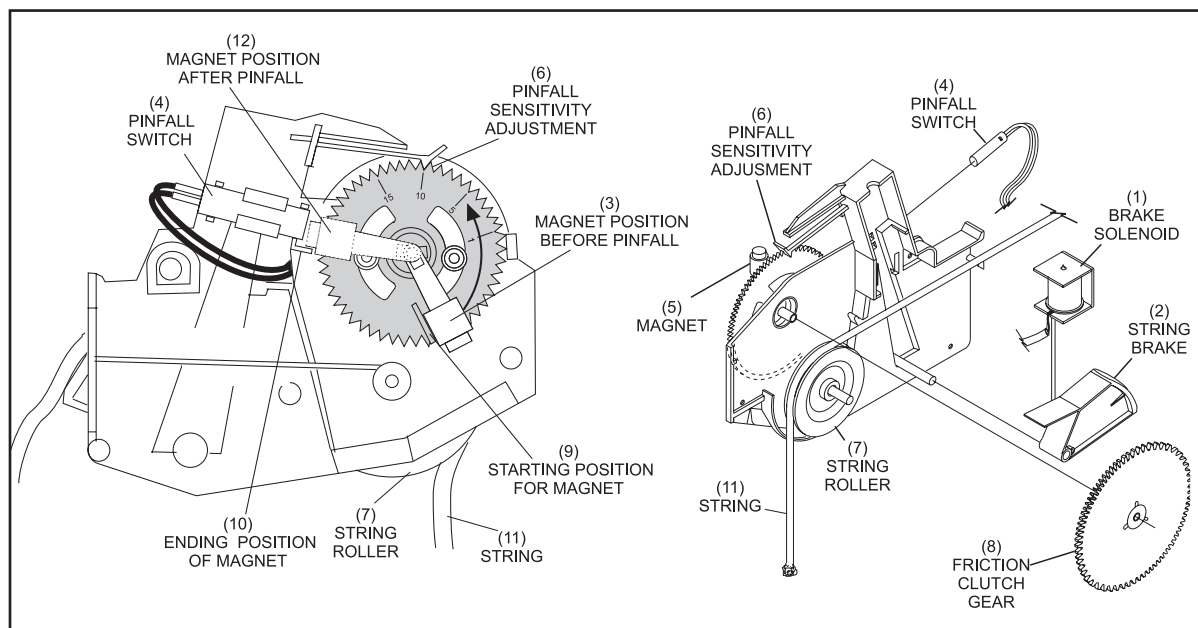


Figure 2-11. String Control Components

- | | | |
|---------------------------------|--------------------------|------------------------------------|
| (1) BRAKE SOLENOID | (2) STRING BRAKE | (3) MAGNET POSITION BEFORE PINFALL |
| (4) PINFALL SWITCH | (5) MAGNET | (6) PINFALL SENSITIVITY ADJUSTMENT |
| (7) STRING ROLLER | (8) FRICTION CLUTCH GEAR | (9) STARTING POSITION FOR MAGNET |
| (10) ENDING POSITION FOR MAGNET | (11) STRING | (12) MAGNET POSITION AFTER PINFALL |

Pin Table

The Pin Table is a stationary frame mounted under the main frame. The main components on the table are the Pin Centering Cones. The cones interact with the pins when they are in the up position to stabilize and position them perpendicular to the pindeck so they can be set vertically onto the pindeck. Refer to *Figure 2-12*.

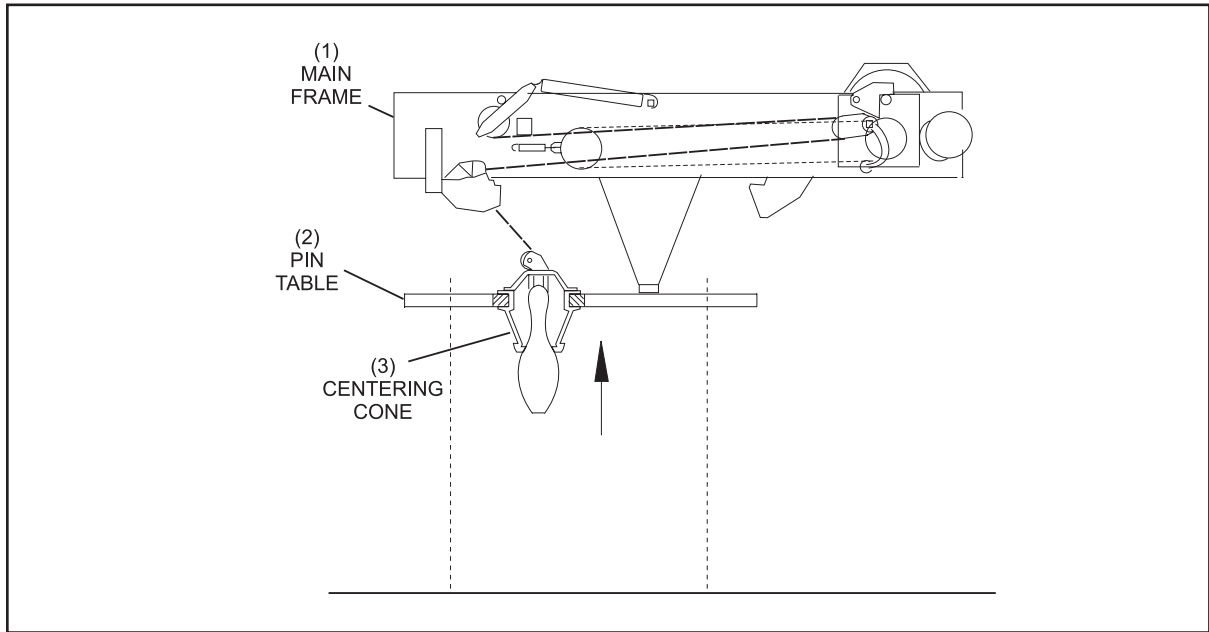


Figure 2-12. String Pinsetter Main Components - Side View

(1) MAIN FRAME

(2) PIN TABLE

(3) CENTERING CONE

Ball Pit

The primary purpose of this area is to handle the initial impact of the pins and ball and direct the ball into the ball accelerator.

The ball pit is made up of 3 main components:

- Ball Stop
- Pit Curtain
- Pit Carpet

The pit curtain is a large piece of carpet like material that stops the rearward movement of the pins and creates a black background behind the pin deck.

The ball stop is a thick piece of non-marking rubber designed to absorb the impact of the ball while at the same time producing as little noise as possible. Refer to *Figure 2-13*.

The pit carpet is used to guide the ball to the ball accelerator's ball door. The pit carpet frame is sloped towards the back of the pinsetter where it is then tapered toward the ball accelerator. This geometry allows gravity to force the ball into the accelerator.

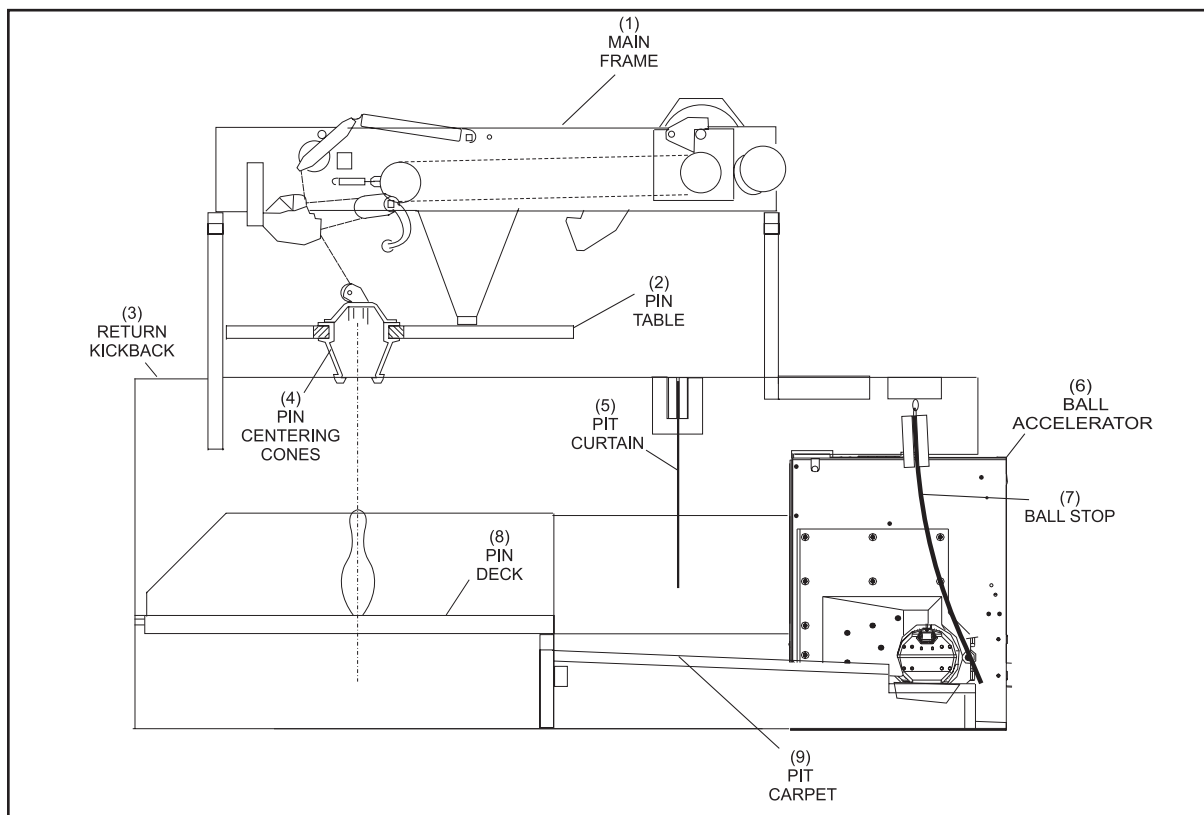


Figure 2-13. String Pinsetter Main Components - Side View

- | | | |
|-------------------------|-----------------|----------------------|
| (1) MAIN FRAME | (2) PIN TABLE | (3) RETURN KICKBACK |
| (4) PIN CENTERING CONES | (5) PIT CURTAIN | (6) BALL ACCELERATOR |
| (7) BALL STOP | (8) PIN DECK | (9) PIT CARPET |

BALL ACCELERATOR

Mounted between the two pinsetters of a lane pair is a ball accelerator that returns balls to the bowler from either lane. The ball enters the accelerator from the pit carpet through a ball door. A large flat belt mounted on two drums grips the ball and propels it forward to the ball lift. Refer to *Figure 2-14*. Power to run the belt is furnished by a three phase motor incorporated into the rear drum.

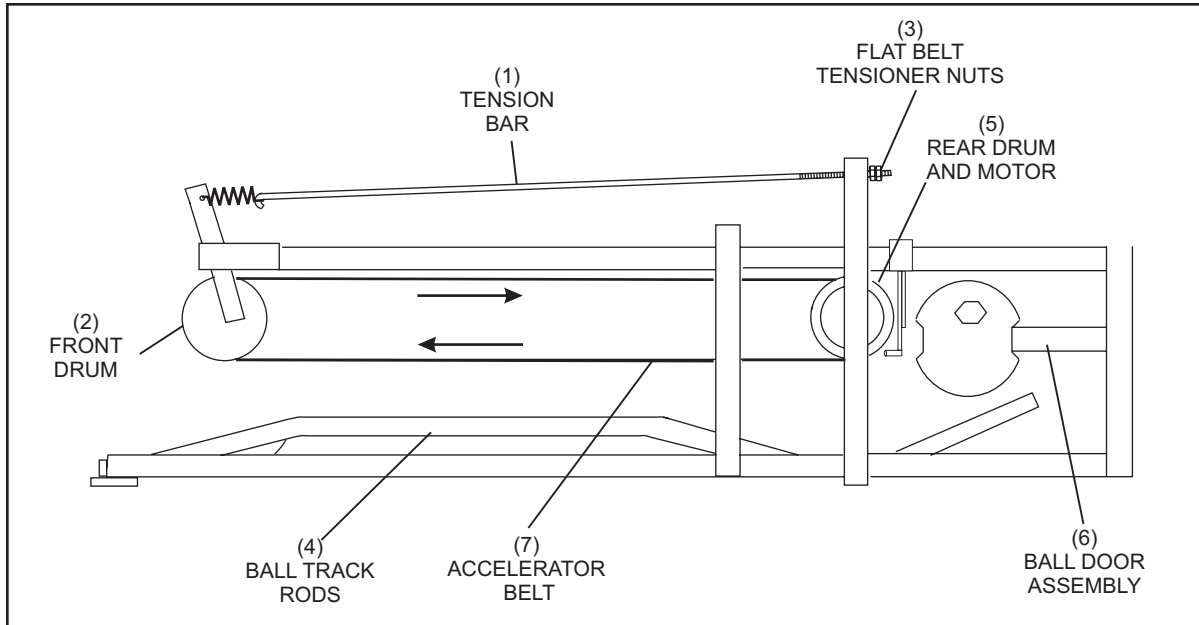


Figure 2-14. Ball Accelerator.

- | | | |
|----------------------|-------------------------|----------------------------|
| (1) TENSION BAR | (2) FRONT DRUM | (3) FLAT BELT TENSION NUTS |
| (4) BALL TRACK RODS | (5) REAR DRUM AND MOTOR | (6) BALL DOOR ASSEMBLY |
| (7) ACCELERATOR BELT | | |

To prevent balls from opposite lanes from entering the accelerator at the same time, ball door assemblies are incorporated into the ball accelerator. Once a door is open, the door for the other lane is blocked from opening. Refer to Figure 2-15.

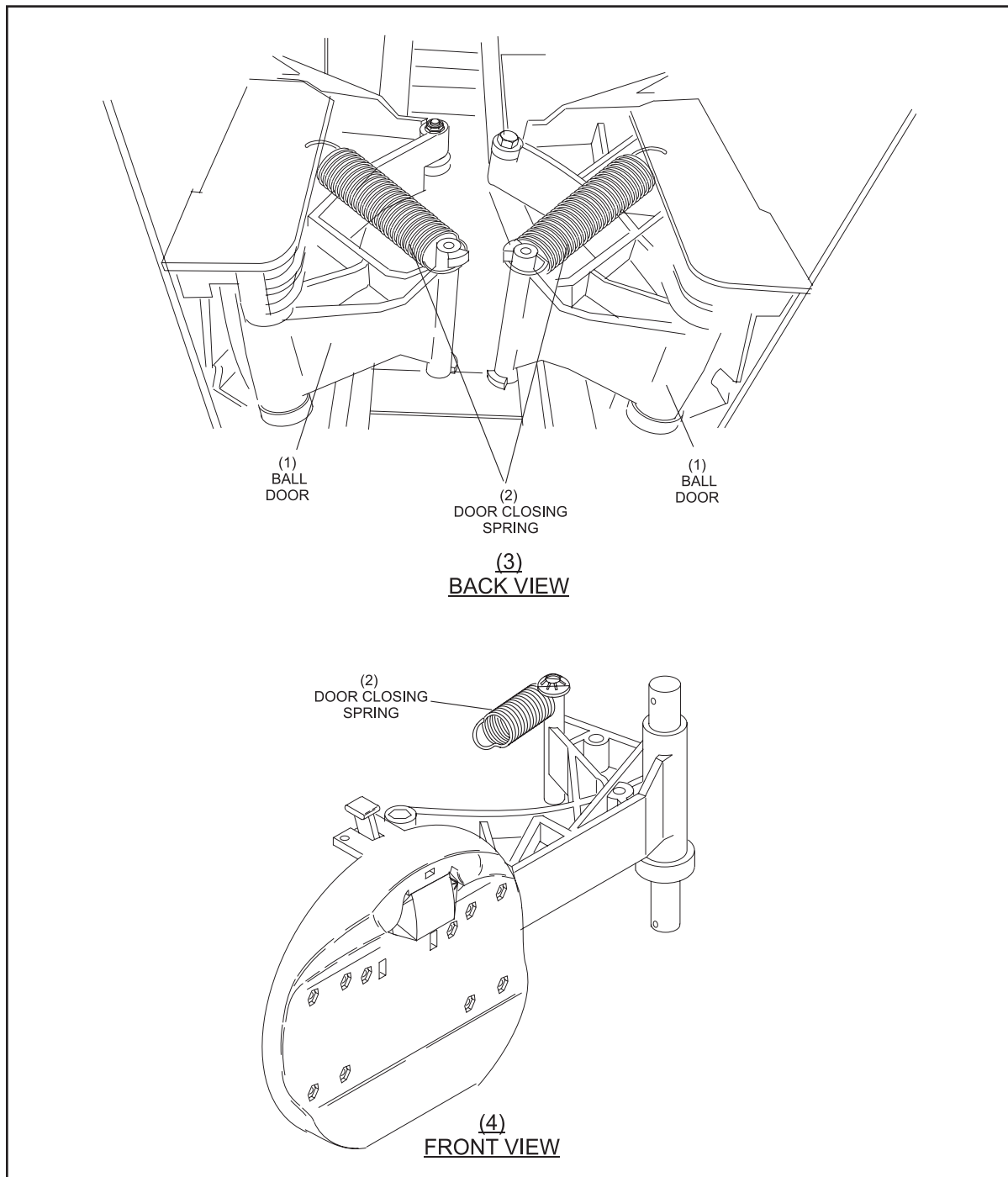


Figure 2-15 Ball Door Assembly.

(1) BALL DOOR
(4) FRONT VIEW

(2) DOOR CLOSING SPRING

(3) BACK VIEW

Section 3 - Pinsetter Electronics

The electronic system for the string pinsetters consist of a StringPin Controller mounted on the curtain wall at the front of each pinsetter. There is a StringPin Control box for each machine. A Vector Scorer interface is also mounted to the curtain wall for pinsetters equipped with automatic scoring. *Refer to Figure 3-1.*

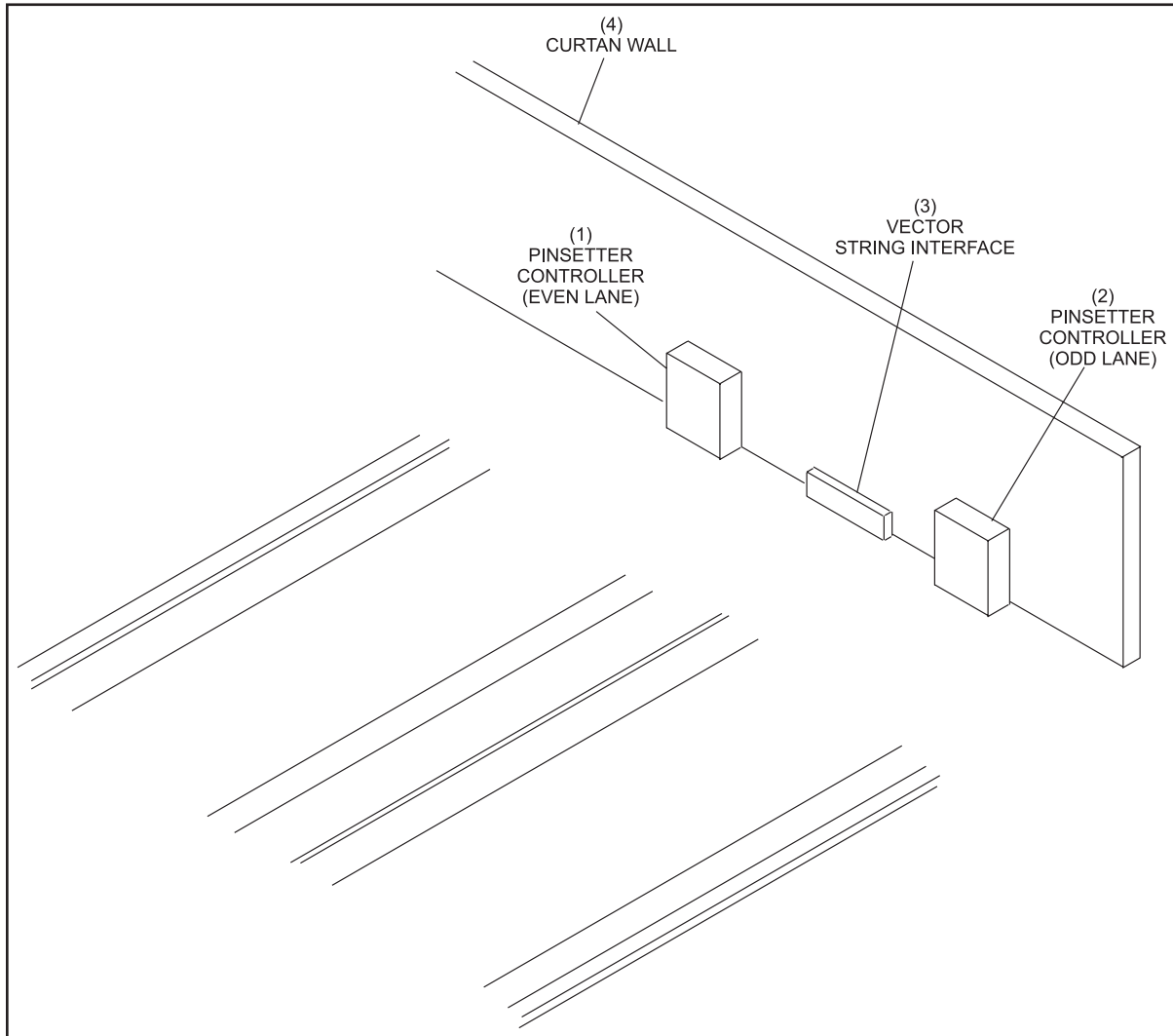


Figure 3-1. String Pinsetter Electronics

- | | | |
|---|--|-----------------------------|
| (1) PINSETTER CONTROLLER
(EVEN LANE) | (2) PINSETTER CONTROLLER
(ODD LANE) | (3) VECTOR STRING INTERFACE |
| (4) CURTAIN WALL | | |

STRINGPIN CONTROL BOX

The StringPin Control box is responsible for the proper operation of the pinsetter. It receives incoming 3-phase power and makes it available to the string wagon drive motor as needed. It also receives incoming information from the switches on the machine and controls the solenoids within the SPICs. The following is a description of the boxes' components and connections.

External

There are no external connections on the StringPin Control Box. The controls that are present include the main power switch and the Pins Up switch. *Refer to Figure 3-2.*

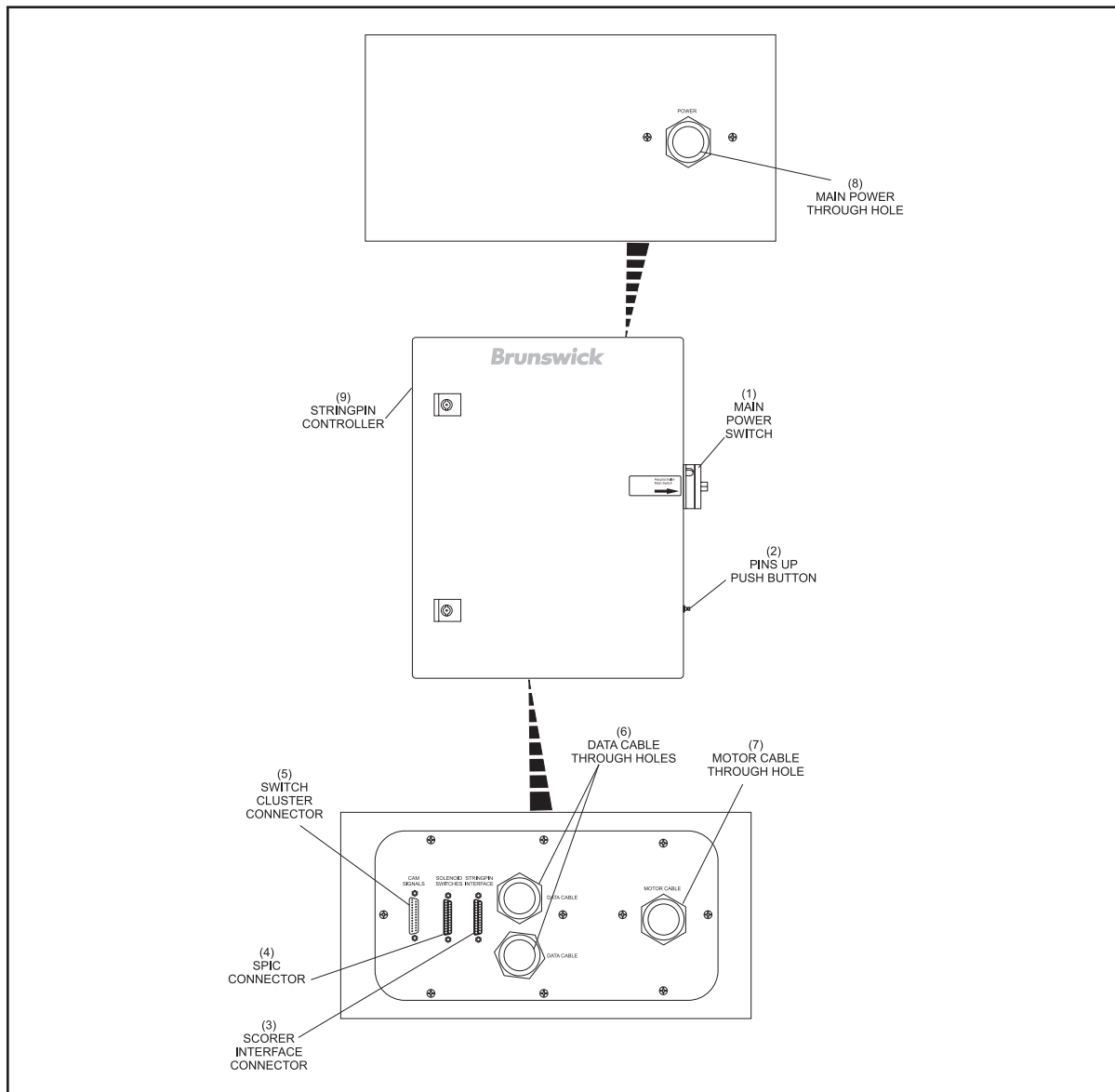


Figure 3-2. StringPin Controller Box - External

- | | | |
|------------------------------|------------------------------|--------------------------------|
| (1) MAIN POWER SWITCH | (2) PINS UP PUSH BUTTON | (3) SCORER INTERFACE CONNECTOR |
| (4) SPIC CONNECTOR | (5) SWITCH CLUSTER CONNECTOR | (6) DATA CABLE THROUGH HOLES |
| (7) MOTOR CABLE THROUGH HOLE | (8) MAIN POWER THROUGH HOLE | (9) STRINGPIN CONTROLLER |

- (1) **Main Power Switch** - Controls the 3-phase power entering the box. In the off position, this switch will disable the pinsetter for that lane.
- (2) **Pins Up Push Button** - This button is used during the string tension adjustment procedure. When pressed, the machine will lift the pins to the full up position stopping the motor at the pins up switch of the switch cluster. Gravity will cause the wagon to reverse direction to lock the wagon on the Stop Dogs and keep the pins in the pin cones.
- (3) **Scorer String Connector** – Connection to the Vector Scoring String Pin Interface for the bowling pin status.
- (4) **SPIC Connector** - Connection for the Brake solenoid and pinfall switch located in the SPICs.
- (5) **Switch Cluster Connector** - Connection for the Home, String Brake and Pins Up switches located in the switch cluster.
- (6) **Data Cable Through Holes** - Access holes used for the masking unit lights, pin light, ball lift control, and pinsetter control cables.
- (7) **Motor Cable Through Hole** - Access hole used for the cables routing to the pinsetter drive and accelerator motors.
- (8) **Main Power Through Hole** - Access hole used for the incoming 3-phase power .

Internal

Internally, the StringPin Controller box contains two circuit boards; a CPU PCB and a High Voltage PCB. Refer to Figure 3-3.

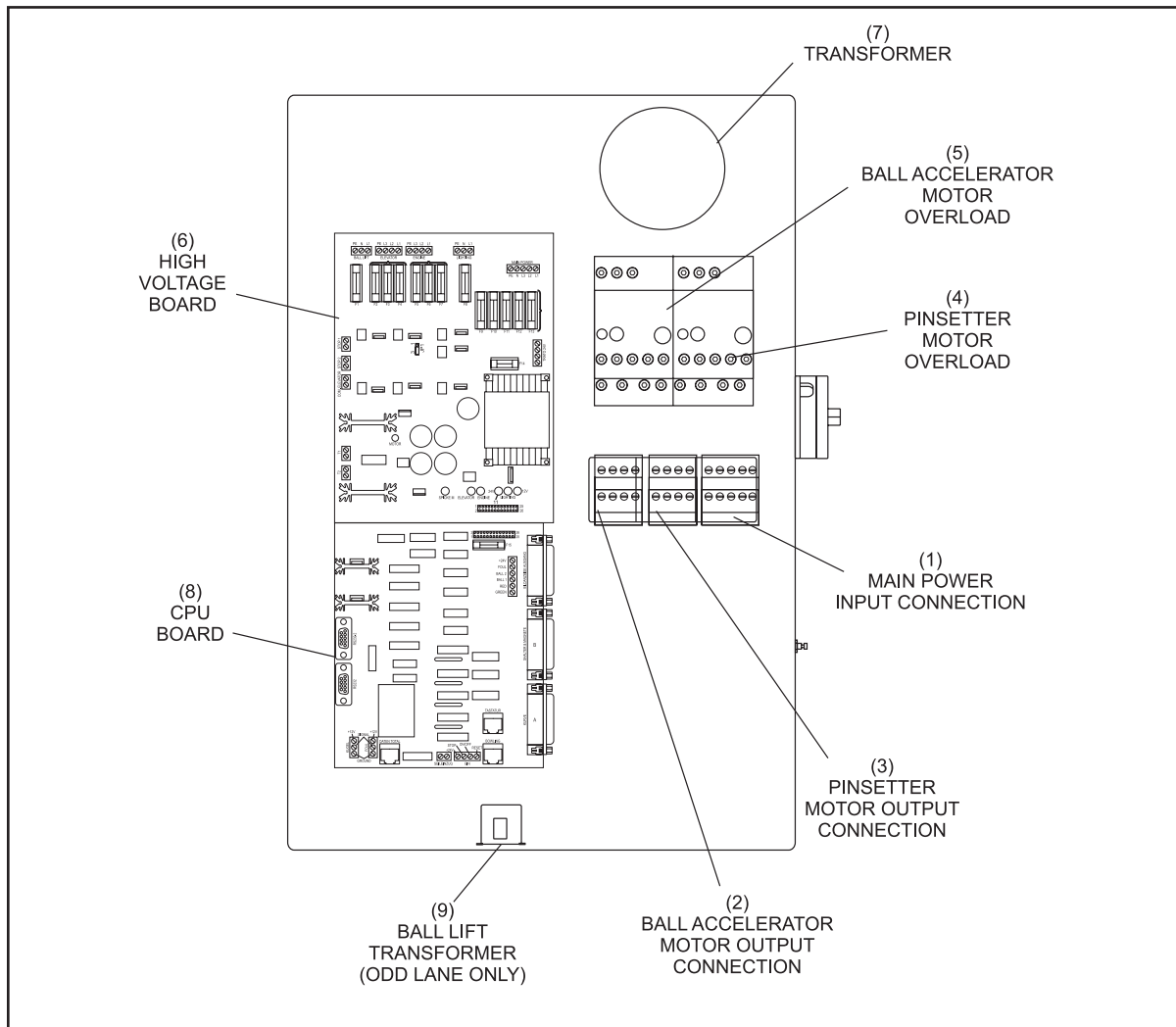


Figure 3-3. StringPin Controller Box - Internal

- | | | |
|---------------------------------|--|---|
| (1) MAIN POWER INPUT CONNECTION | (2) BALL ACCELERATOR MOTOR OUTPUT CONNECTION | (3) PINSETTER MOTOR OUTPUT CONNECTION |
| (4) PINSETTER MOTOR OVERLOAD | (5) BALL ACCELERATOR MOTOR OVERLOAD | (6) HIGH VOLTAGE BOARD |
| (7) TRANSFORMER | (8) CPU BOARD | (9) BALL LIFT TRANSFORMER (ODD LANE ONLY) |

StringPin Pinsetter Service Manual

The following is a description of the String Pin High Voltage PCB components and connections.

Fuses

- (1) **Ball Lift Fuse (F1)** - Fuse used to protect the ball lift relay from excessive current when turning the ball lift relay on. The fuse is rated at 250V 0.1A - fast blow.
- (2) **Ball Accelerator Fuses (F2 – F4)** - Fuses used to protect the accelerator from excessive current when turning the accelerator on. The fuse ratings for 380V power is 250V 1.6 A and for the 208/220V power is 250V 3.15 A - fast blow.
- (3) **Drive Motor Fuses (F5 – F7)** - Fuses used to protect the string pinsetter motor from excessive current when turning the string pinsetter motor on. The fuse ratings for 380V power is 250V 1.6 A and for the 208/220V power is 250V 3.15 A - fast blow.
- (4) **Pinlight Fuse (F8)** - Fuse used to protect the pin light from excessive current. The fuse is rated at 250V 2.0 A - fast blow.
- (5) **Main Power Fuses (F9 – F13)** - Fuses used to protect the PC board from excessive current.
 - F9 - F11** protects the L1, L2, and L3 input power. The fuse ratings for F9 - F11 are 250V 4.0 A - fast blow.
 - F12** protects the ground of the board. The fuse rating for F12 is 250V 0.5 A - fast blow.
 - F13** protects the neutral of the board. The fuse rating for F13 is 250V 1.6 A - fast blow.
- (6) **PCB Fuse 24V (F14)** - Fuse used to protect the PC board from excessive current on the 24V power line. The fuse rating 250V 10.0 A - fast blow.

LEDs

- (7) **24V LED** - This LED lights when the AC voltage for the 24 Volt circuitry is operating.
- (8) **12V Power LED** - This LED lights when the AC voltage for the 12 Volt circuitry is operating.
- (9) **Pin Light LED (Lighting)** - This LED lights when the voltage for the pin light circuitry is operating.
- (10) **Drive Motor LED (Engine)** - This LED lights when the voltage for the string pinsetter motor circuitry is operating.
- (11) **Accelerator Motor LED (Elevator)** - This LED lights when the voltage for the ball accelerator motor circuitry is operating.
- (12) **Brake LED (Spicke M)** - This LED lights when the voltage used to energize the brake solenoids in the SPICs is operating.
- (13) **Motor Fault LED** - This LED is connected to T1 and T2 connectors. It will light if T1 or T2 has an open connection. The thermal overload protection of the accelerator and string pinsetter motors are usually connected to T1 and T2.

Jumper

- (14) **Bowling Type Jumper (JP1)** - Jumper pins 1 & 2 for Kegal. Jumper pins 2 & 3 for bowling

Connectors

- (15) **Motor Overload 1 (T1)** - Connection for the thermal overload protection circuit inside the pinsetter drive motor.
- (16) **Motor Overload 2 (T2)** - Connection for the thermal overload protection circuit inside the ball accelerator motor.
- (17) **To CPU** - Ribbon cable connector for the communication between the CPU and High Voltage PCB.
- (18) **Accelerator Connect Line (Com Elevator)** - Interconnection between the Pinsetter Controllers of a lane pair that allows the even lane control box to operate the accelerator and the ball lift.
Reference (25) Ball Accelerator
- (19) **Pin Light (Lighting)** - Connection that provides single phase 220/208V power to the pin light.
- (20) **Transformer (Trato 24V)** - This connects to the transformer to convert input power of 380/220/208 to 24 VAC for the PCB
- (21) **Main Power** - Input power connection for the 3-phase power. This voltage can be 208, 220 or 380V AC.
- (22) **Stop Switch 1 (Stop1)** - Connection for the two Stop/Run switches on the pinsetter. The two Stop/Run Switches are connected in series so either can disable the pinsetter.
- (23) **Stop Switch 2 Stop2** - Connection for an optional stop run switch. Normally this connection is shorted (jumped). If this connection is left “open” the machine will not operate.
- (24) **Ball-Lift** - This is a 24V AC supply for the ball lift relays. The output is protected with at 250V 0.1A fast blow fuse. Reference (1) Ball Lift Fuse.
- (25) **Ball Accelerator (Elevator)** - Output for the three phase 380/220/208V power for the accelerator. The wires from this output connect to the Accelerator Motor Overload. *Reference Figure 3-3.*



NOTE: *This connection is only used on the left (Odd) lane Pinsetter Controller. The Right (even) lane can control the accelerator and ball lift through the odd lane controller via the Accelerator Connect Line cable. Reference (18) Accelerator Connect Line.*

- (26) **Drive Motor (Engine)** - Output for the three phase 380/220/208V power to the Pinsetter Drive Motor. The wires from this output connect to the Pinsetter Drive Motor Overload. *Reference Figure 3-3.*

String Pin CPU PCB

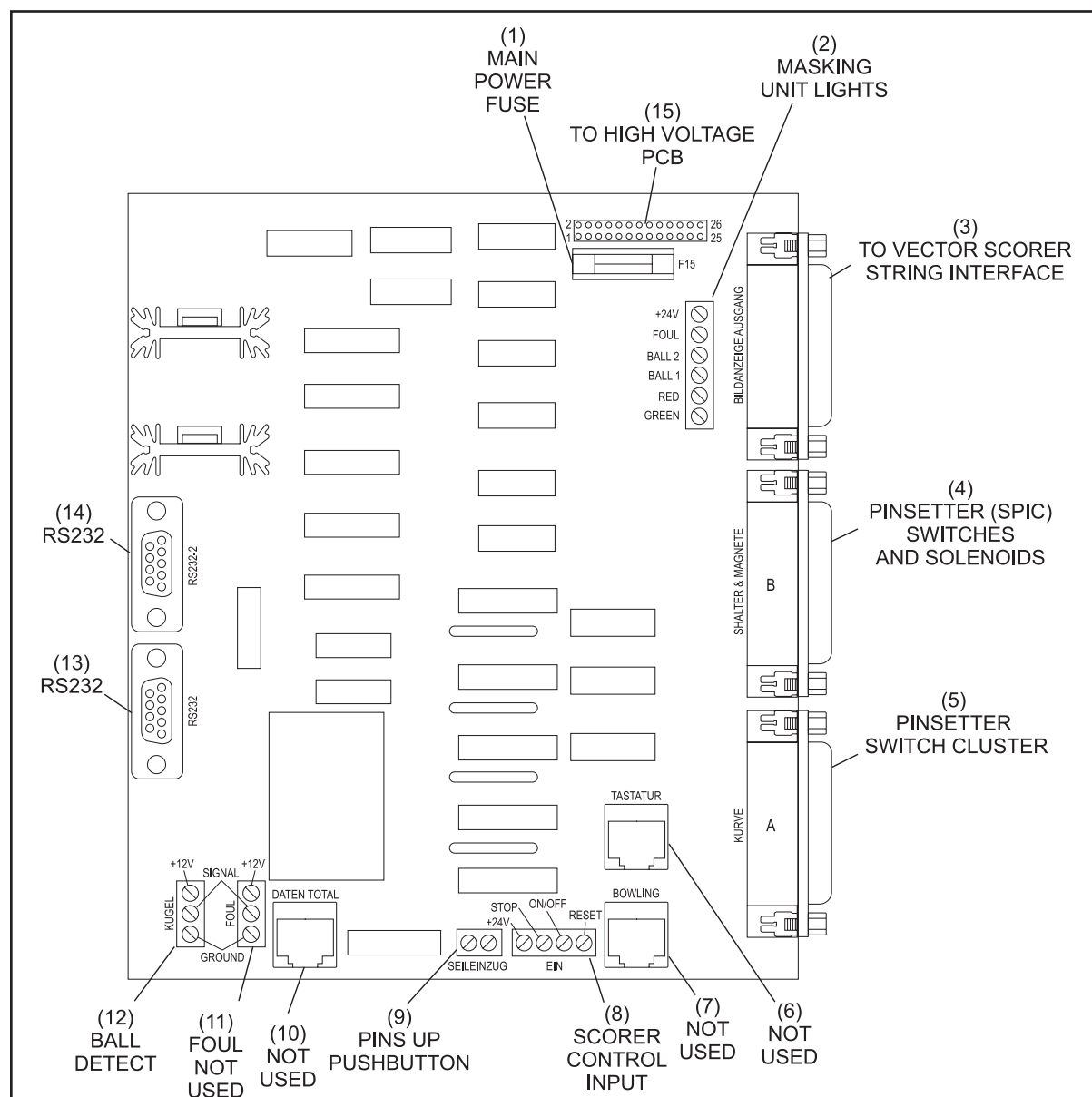


Figure 3-5. CPU PCB

The following is a description of the String Pin High CPU PCB components and connections.

Fuses

- (1) **Main Power Fuse (F15)** - Fuse used to protect the CPU PCB from excessive current on the 24VAC input. The fuse rating is 250V 2.0 A - fast blow

Connectors

- (2) **Masking Units Lights** - Connection for the 1st and 2nd ball light
- (3) **Vector Scorer String Interface** - Connection to the Vector Scoring String Pin Interface for the bowling pin status
- (4) **Pinsetter (SPIC) Switches and Solenoids** - Connection for the Brake solenoid and pinfall switch located in the SPICs.

- (5) **Pinsetter Switch Cluster** - Signals from the Home, String Brake and Pins Up switches located in the switch cluster.
- (6) **TASTER** - Not Used
- (7) **Bowling** – Not Used
- (8) **Scorer Control Input** - Connection used by the Vector Scoring String Pin Interface to turn the string pinsetter on/off and to reset pins.
- (9) **Pins Up Push Button** – Connector for the Pins Up push button located on the left side of the control box. The button is used to toggle the pins up and down during the string tension adjustment.
- (10) **Data Tota** – Not Used
- (11) **Foul** – Not used.
- (12) **Ball Detect (Kugel)** – Connection for the pinsetter ball detector.
- (13) **RS232** - Not Used
- (14) **RS232** - Not Used
- (15) **To High Voltage PCB** – Communication between the CPU and High Voltage PCB

Vector String Pinsetter Interface

The Vector String Pinsetter Interface connects the String Pinsetters for a lane pair to the Vector scoring systems. The interface monitors the pinfall switches located in the pinsetters' SPICs to determine the each score. Ball detectors dedicated to the scoring system are used to ensure that the switches are read at the appropriate time. When enabled, the interface provide on/off and reset (cycle) control for the pinsetters. Refer to Figure 3-6 and Figure 3-7.

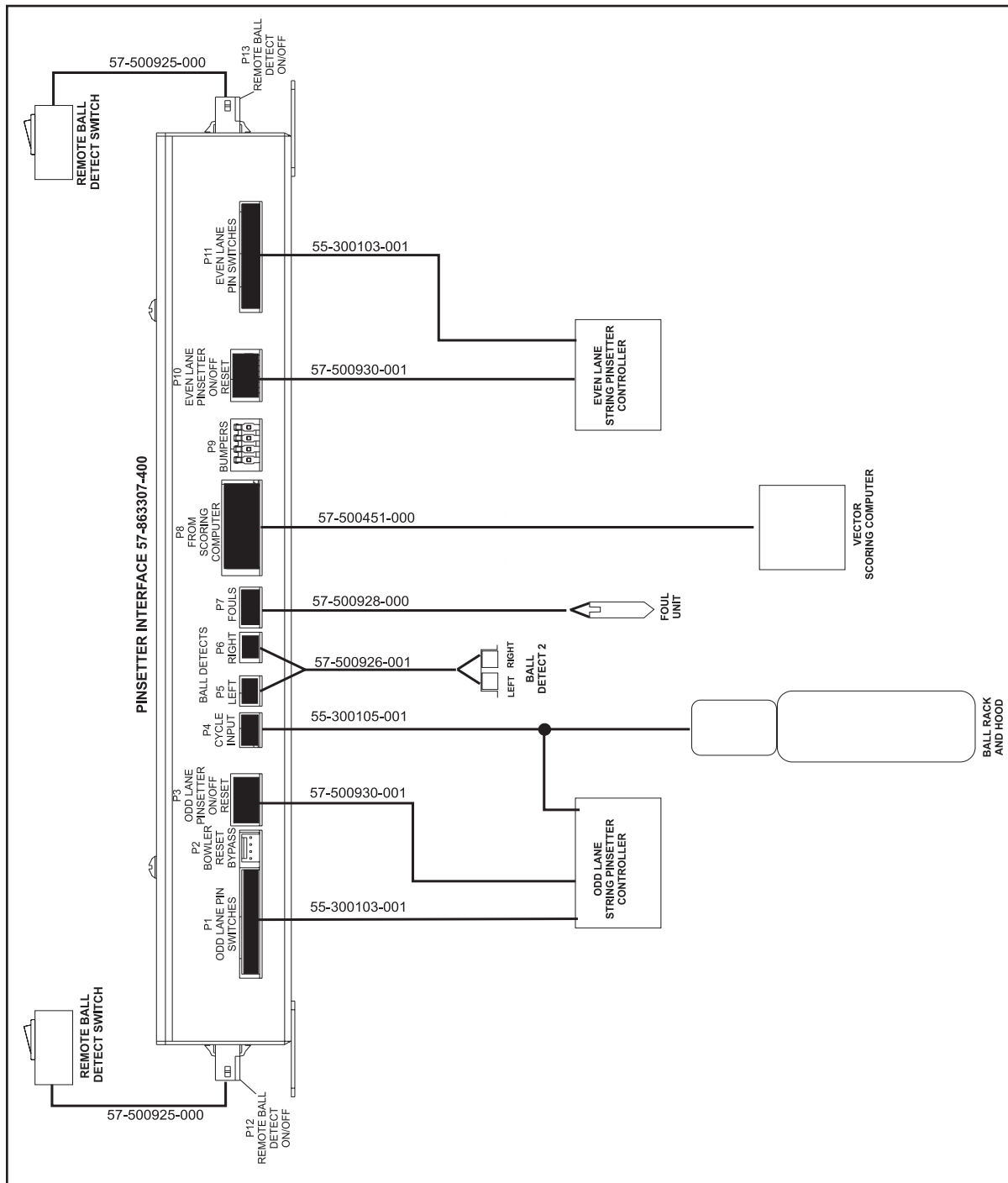


Figure 3-6. Overview of Standard Cables

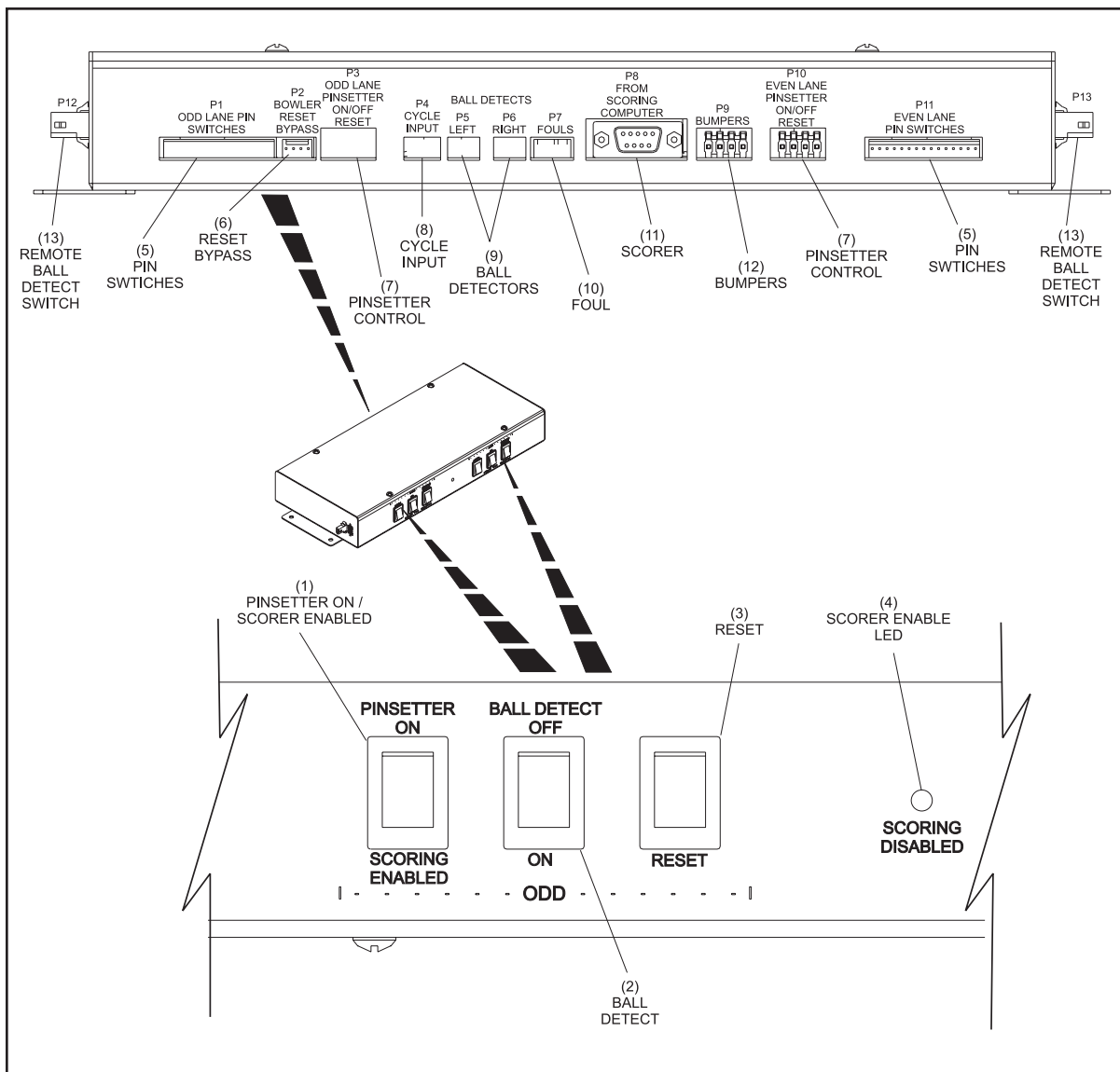


Figure 3-7. Vector Interface - External

The following is a description of the pinsetter interface controls and connections.

- (1) **Pinsetter On/Scoring Enabled** - This switch determines if the scoring system is in control of the pinsetters (Scoring Enabled) or if the pinsetters will function as “stand alone” (Pinsetter ON). When in the “Scoring Enabled” mode, the pinsetter will turn on and cycle by the scoring system. In the “Pinsetter On” mode there is no communication to the scoring system and the machines will function without scoring influence.
- (2) **Ball Detect** - Enables/disables the scorer ball detectors. This switch determines whether the scoring system will react to a ball passing through the scorer ball detect beam. Normally this switch is kept in the enabled position. Use the “Disabled” when entering the pinsetter to untangling pin strings or to perform other service to ensure the scoring system does not try to score if the ball detector beam is blocked.
- (3) **Reset** - Causes the machine to set 10 pins.
- (4) **Scoring Disabled** - This LED lights to indicate the scoring system will not attempt to score or control the pinsetter. The light will turn on when either the “Pinsetter On” mode is selected or “Ball Detect” switch is set to “Off”.
- (5) **Pin Switches (P1, P11)** - Input for the signals from the pinfall switches located on pinsetter SPICs. P1 is for the left/odd lane pinsetter. P11 is for the right/even lane pinsetter.
- (6) **Reset Bypass (P2)** - An alternative connection for the reset buttons located on the bowler’s ball rack that connects them directly to the Pinsetter Control (P3,P10) output connectors. This allows direct reset the pinsetters, instead of having the reset relays on the interface board control the reset function. This connection is currently not used.
- (7) **Pinsetter Control (P3, P10)** - Connection to the Pinsetter Controller that allows the interface PCB to turn the pinsetter on/off and reset (cycle) the pinsetter. P3 connects to the odd lane pinsetter. P10 connects to the even lane pinsetter.
- (8) **Cycle Input (P4)** - Input for the reset buttons located on the bowler’s ball rack. When the interface receives a signal from the reset button, it will command the appropriate machine to set a new rack of pins.
- (9) **Ball Detectors (P5, P6)** - Connection for the signal and power for the scorer ball detectors. P5 is for the odd lane ball detector. P6 is for the even lane ball detector.
- (11) **Scorer (P8)** - Connection for RS-232 communication for the Vector scorer computer.
- (10) **Foul (P7)** - Input for the signals from the foul units for both the left and right lanes. Also refer to the on board jumper - Foul Jumper (JP4).
- (12) **Bumpers (P9)** - Connection to AMF/Qubica automated bumpers.
- (13) **Remote Ball Detect Switch** - Connection for an optional remote switch to Enable/disable the scorer ball detectors. The connector is wired in parallel with the Ball Detect chassis mounted ball detect switch. Refer to (2) Ball Detect. A remote mounted switch provides a convenient location to “Disabled” the scorer ball detect so the scoring system does not try to score if the ball detector beam is blocked. It can be used when entering the pinsetter for situations such as untangling pin strings or to perform other service.

Vector Interface PCB

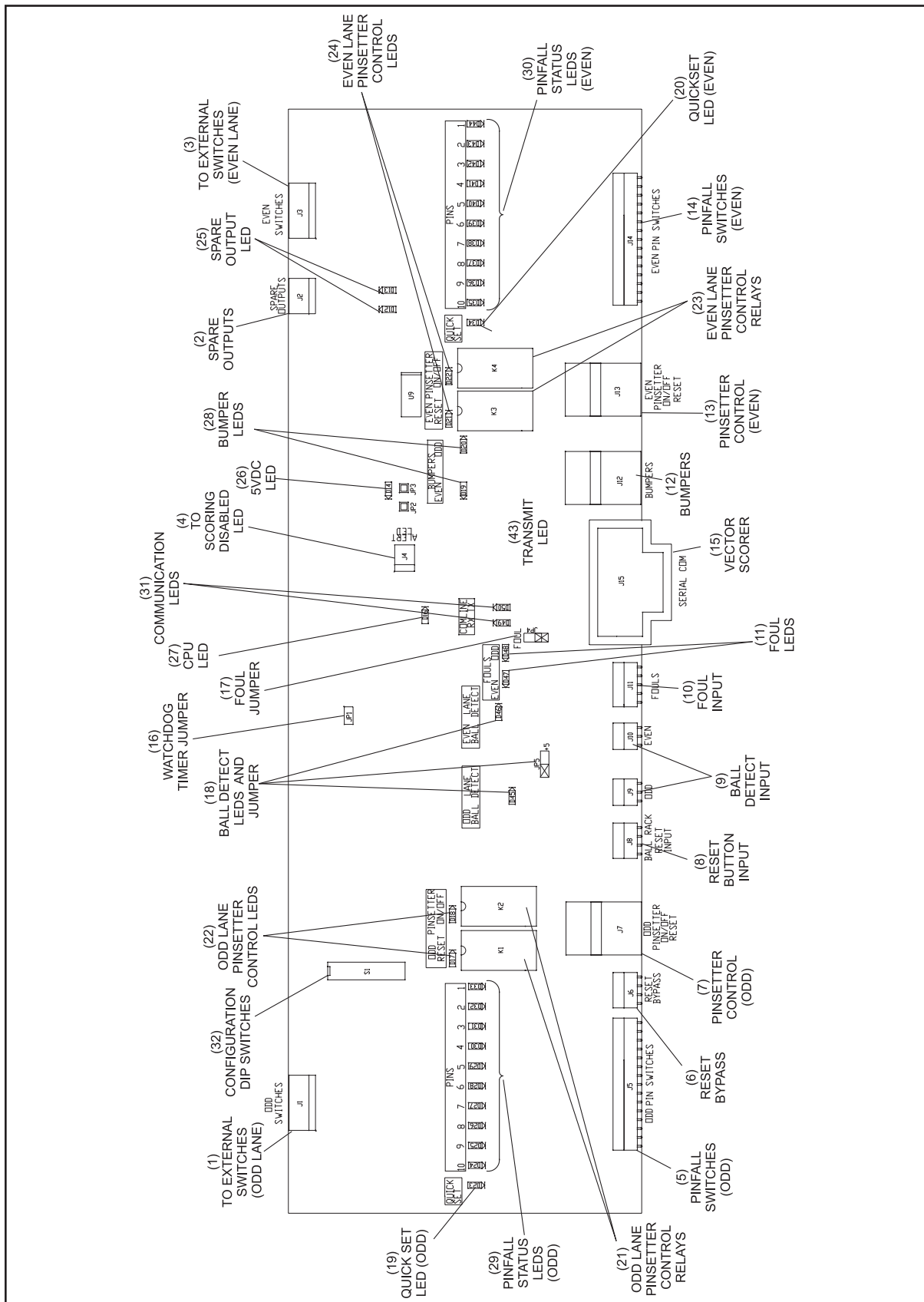


Figure 3-8. Vector Interface PCB

The following is a description of the Interface boxes' components and connections.

- (1) **To External Switches - Odd Lane (J1)** - Connection for the left pinsetter's "Pinsetter ON/Scorer Enabled", "Ball Detect On/Off", and "Reset" (cycle) switches located on the enclosure.
- (2) **Spare Outputs (J2)** - Outputs that can be used for addition functions such as controlling ball door solenoids on short pit installation. These outputs are not used for standard pinsetter installations.
- (3) **To External Switches - Even Lane (J3)** - Connection for the left pinsetter's "Pinsetter ON/Scorer Enabled", "Ball Detect On/Off", and "Reset" (cycle) switches located on the enclosure.
- (4) **Scoring Disabled LED (J4)** - Connector for the scoring disabled LED located on the outside of the enclosure. The LED lights to indicate the scoring system will not attempt to score or control the pinsetter. The light will turn on when either the "Pinsetter On" mode is selected or "Ball Detect" switch is set to "Off".
- (5) **Pinfall Switches - Odd (J5)** - Input for the signals from the pinfall switches located on pinsetter SPICs of the left/odd pinsetter.
- (6) **Reset Bypass (J6)** - An alternative connection for the reset buttons located on the bowler's ball rack that connects them directly to the Pinsetter Control (J7,J14) output connectors. This allows direct reset the pinsetters, instead of having the reset relays on the interface board control the reset function. This connection is currently not used.
- (7) **Pinsetter Control - Odd (J7)** - Connection to the odd lane Pinsetter Controller that allows the interface PCB to turn the pinsetter on/off and reset (cycle) the pinsetter.
- (8) **Reset Button Input (J8)** - Input for the reset buttons located on the bowler's ball rack. When the interface receives a signal from the reset button, it will command the appropriate machine to set a new rack of pins.
- (9) **Ball Detect Input (J9, J10)** - Connection for the signal and power for the scorer ball detectors. Connection J9 is for the odd lane ball detector. Connection J10 is for the even lane ball detector.
- (10) **Foul (J11)** - Input for the signals from the foul units for both the left and right lanes. Also refer to (11) Foul LEDs and (17) Foul Jumper (JP4).
- (11) **Foul LEDs (D47, D48)** - These LEDs light when a foul occurs on the lane. D47 indicates a foul on the right/even lane. D48 indicates a foul on the odd/left lane.
- (12) **Bumpers (J12)** - Connection to AMF/Qubica automated bumpers. Also refer to (30) Bumper LEDs.
- (13) **Pinsetter Control - Even (J13)** - Connection to the even lane Pinsetter Controller that allows the interface PCB to turn the pinsetter on/off and reset (cycle) the pinsetter.
- (14) **Pinfall Switches - Even (J14)** - Input for the signals from the pinfall switches located on pinsetter SPICs of the right/even pinsetter.

- (15) **Vector Scorer (J15)** - Connection for RS-232 communication for the Vector scorer computer. The Interface board also receives its operating power (12VDC) through this connection.
- (16) **Watch Dog Timer Jumper (JP1)** - Jumper used to enable/disable the watchdog timer. Remove this jumper to disabled the timer.
- (17) **Foul Jumper (JP4)** - Jumper used to configure the interface so that is can properly handle the foul input signal. When using Brunswick foul units or foul units that uses a relay type (switch) output, install a jumper to short the pins. If using a foul unit that supplies +12VDC as an output (AMF), remove the jumper.
- (18) **Ball Detect LEDs and Jumper (D45, D46, JP5)** - The Jumper used to configure the interface PCB to power the ball detectors with 5VDC or a 12VDC. For Vector ball detects set the jumper to 12VDC. LED D45 lights when there is a ball detection on the left/odd lane. LED D46 lights when there is a ball detection on the right/even lane.
- (19) **Quick Set LED - Odd (D23)** - Not Used (for Mendes pinsetters only)
- (20) **Quick Set LED - Even (D34)** - Not Used (for Mendes pinsetters only)
- (21) **Odd Lane Pinsetter Control Relays (K1 , K2)** - Relays used to turn the pinsetter on/off and reset (cycle) the pinsetter. When energized , K2 turns the pinsetter “on” , K1 causes the pinsetter to set new pins. Also refer to (22) Odd Lane Pinsetter Control LEDs.
- (22) **Odd Lane Pinsetter Control LEDs (D17 , D18)** - These LEDs light when the corresponding pinsetter control relay energizes. D17 indicates a the reset relay is energized. D18 indicates the power relay is energized.
- (23) **Even Lane Pinsetter Control Relays (K3 , K4)** - Relays used to turn the pinsetter on/off and reset (cycle) the pinsetter. When energized , K4 turns the pinsetter “on” , K3 causes the pinsetter to set new pins. Also refer to (22) Even Lane Pinsetter Control LEDs.
- (24) **Even Lane Pinsetter Control LEDs (D21 , D22)** - These LEDs light when the corresponding pinsetter control relay energizes. D21 indicates a the reset relay is energized. D22 indicates the power relay is energized.
- (25) **Spare Output LEDs (D12, D13)** - Not Used These LEDs light when the spare outputs are in use.
- (26) **5V LED (D14)** - This LED lights the indicate +5VDC is present (board power).
- (27) **CPU LED (D16)** - Blinking when the microprocessor is running.
- (28) **Bumper LEDs (D19, D20)** - These LEDs light when the power is sent to the AMF/Qubica automated bumpers. Led D19 indicates the right/even lane bumper is energized. Led D20 indicates the left/odd lane bumper is energized.
- (29) **Pinfall Status LEDs - Odd (D24-D33)** - Used to indicate the state of the pins for the left/odd lane. An on LED indicates the corresponding pin has been knocked over.

- (30) **Pinfall Status LEDs - Even (D35-D44)** - Used to indicate the state of the pins for the right/even lane. An on LED indicates the corresponding pin has been knocked over.
- (31) **Communication LEDs (D49, D50)** - These LEDs flash to indicate communication to and from the scorer. D49 flashes when the interface is receiving information from the scorer. D50 flashes when the interface is sending information to the scorer.
- (32) **Configuration Dip Switches (S1)** - An eight position dipswitch used to configure the interface. For the Brunswick StringPin Pinsetter, turn all switch positions to “Off”

Position 1 - Standing Pin Polarity

ON = If the pin LEDs (LED's D35-D44 or D34-D33) are normally “On” and turn “Off” when a fallen pin is detected.

OFF = If the pin LEDs (LED's D35-D44 or D34-D33) are normally “Off” and turn “On” when a fallen pin is detected.

Position 2 - Bowling Type

ON = 5-pin bowling

10-pin bowling

Positions 3, 4 - Not Used.

Position 5 - Pinsetter Type

ON = CA1 pinsettter (5 pin)

OFF = all other pinsetters

Positions 6 - 8 - Not Used.

Pinsetter Interface Configuration Settings for Brunswick StringPin Pinsetter

1. **Foul Jumper (JP4)** - Jumper used to configure the interface so that it can properly handle the foul input signal. When using Brunswick foul units or foul units that use a relay type (switch) output, install a jumper to short the pins. If using a foul unit that supplies +12VDC as an output (AMF) remove the jumper.
2. **Ball Detect Jumper (JP5)** - For Vector ball detects set the jumper to 12VDC.
3. **Dipswitch S1** - All positions should be set to “OFF”

PINSETTER SWITCHES AND SOLENOIDS

De-tangling Bar and Switch

If the string of two or more pins become tangled as the pins are being raised, additional string pressure is put on the tension lever assemblies causing them to rotate into the de--tangling bar. This action rotates the cam located on the end of the bar off of the de-tangle switch. The machine enters a de-tangle sequence in an attempt to remedy the problem buy using the drive motor to create an up and down motion of the pins.

During the de-tangle sequence, the drive motor will shut off to release the string tension and allow the pins to lower towards the pindeck. After two seconds, the motor turns back on to raise the pins. If a tangle is still present it will again be detected by the de-tangle switch and the motor will shut off for another two seconds. After five failed attempts to correct the problem, the motor will shut off for five seconds to allow the pins to lower to the pindeck. This 2, 2, 2, 2, 5 second shaking pattern will continue until the strings are no longer tangled or a service person turns off the machine and manually corrects the problem. Refer to *Figure 3-9*.

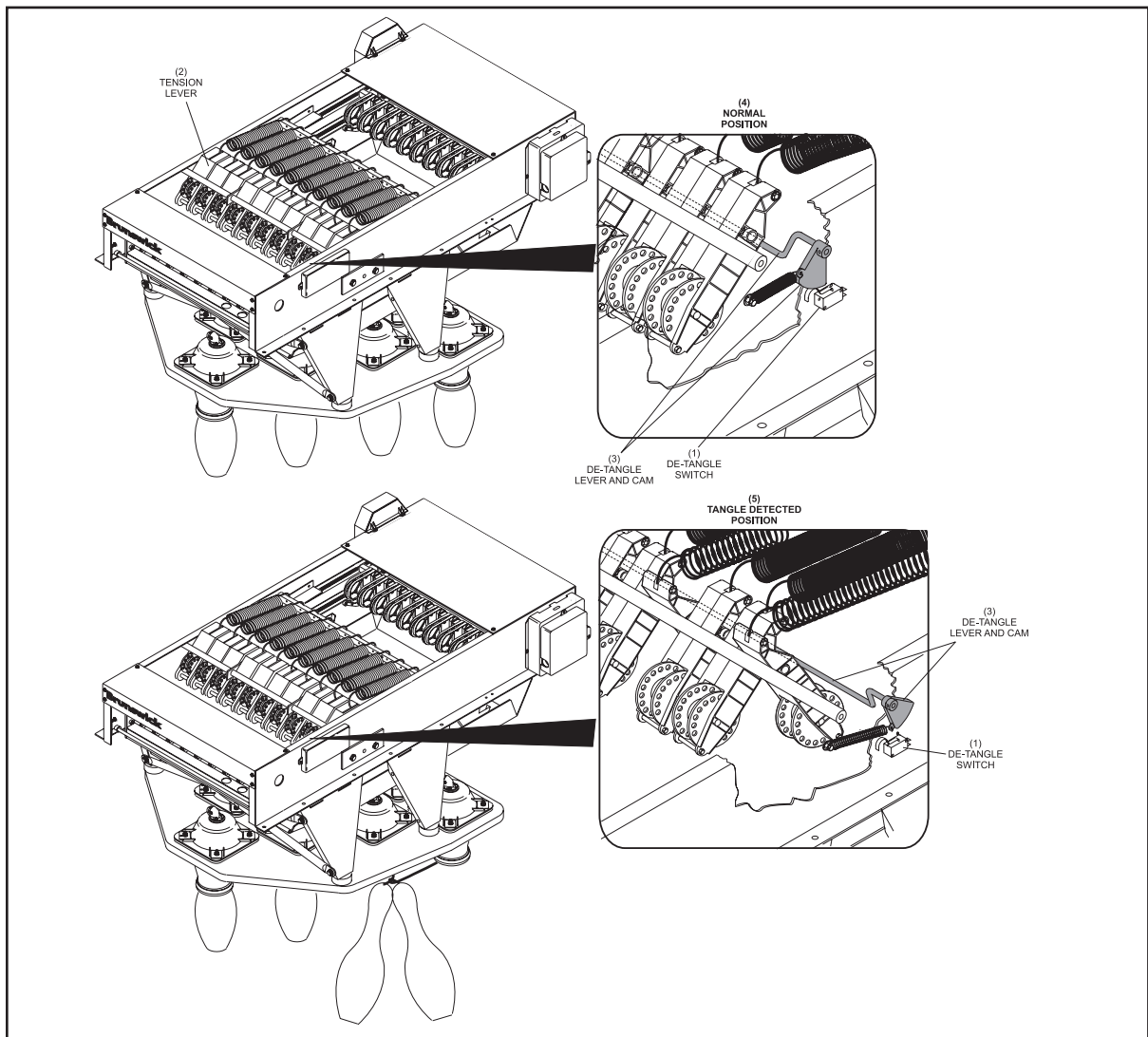


Figure 3-9. Disentangle Switch Activation

- | | | |
|----------------------|------------------------------|-----------------------------|
| (1) DE-TANGLE SWITCH | (2) TENSION LEVER | (3) DE-TANGLE LEVER AND CAM |
| (4) NORMAL POSITION | (5) TANGLE DETECTED POSITION | |

Switch Cluster Switches

The pinsetter uses a 3-phase motor and V-belt to run the string wagon drive gear and shaft. A cam and switch cluster located at the opposite end of the drive shaft determines the location of the string wagon by monitoring the rotation of the shaft. Refer to *Figure 3-10*

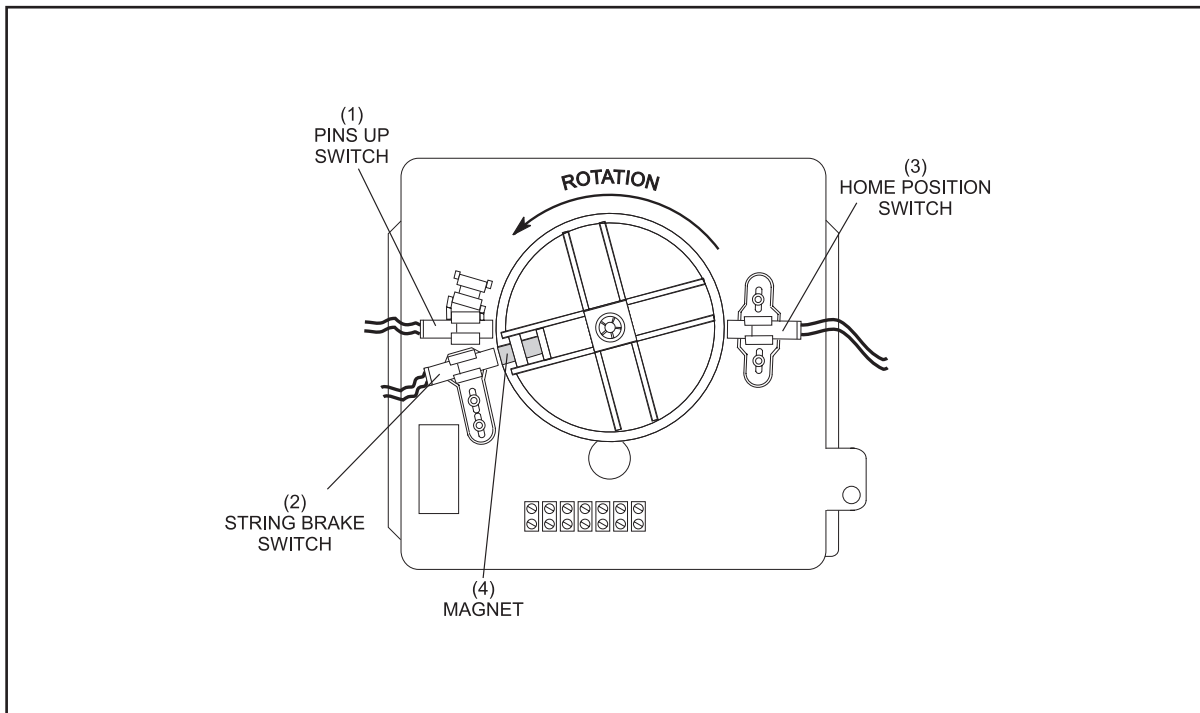


Figure 3-10. Switch Cluster

- | | | |
|--------------------|-----------------------|--------------------------|
| (1) PINS UP SWITCH | (2) FALLEN PIN SWITCH | (3) HOME POSITION SWITCH |
| (4) MAGNET | | |

The switches in the cluster include:

1. Pins Up Switch - This switch indicates when the string wagon is at the back of the machine and the pins are in the “up” position.
2. String Brake Switch - This switch is used after pins have been knocked over on a first ball delivery. In operation, after the string wagon has passed the pins up position, this switch causes the string brake solenoids inside the SPIC (StringPin Pinsetter Interface Control) for those pins that were knocked over to energize. This keeps the pins from lowering onto the pindeck as the wagon travels toward the front of the machine.
3. Home Position Switch - This switch indicates when the string wagon is at the front of the machine and the pins are sitting on the pindeck. This switch caused the motor to shut off after setting the pins onto the pindeck.

String Brake Solenoid

The String Brake Solenoid is located inside the SPIC. It controls whether the pin is allowed to lower to the pindeck. In normal operation the string is allowed to move freely through the SPIC to allow the pin to lower to the pindeck. The solenoid is energized as needed when the String Brake switch in the switch cluster is actuated forcing the string brake to pinch the string prohibited the it from passing through the SPIC. Refer to *Figure 3-11*.

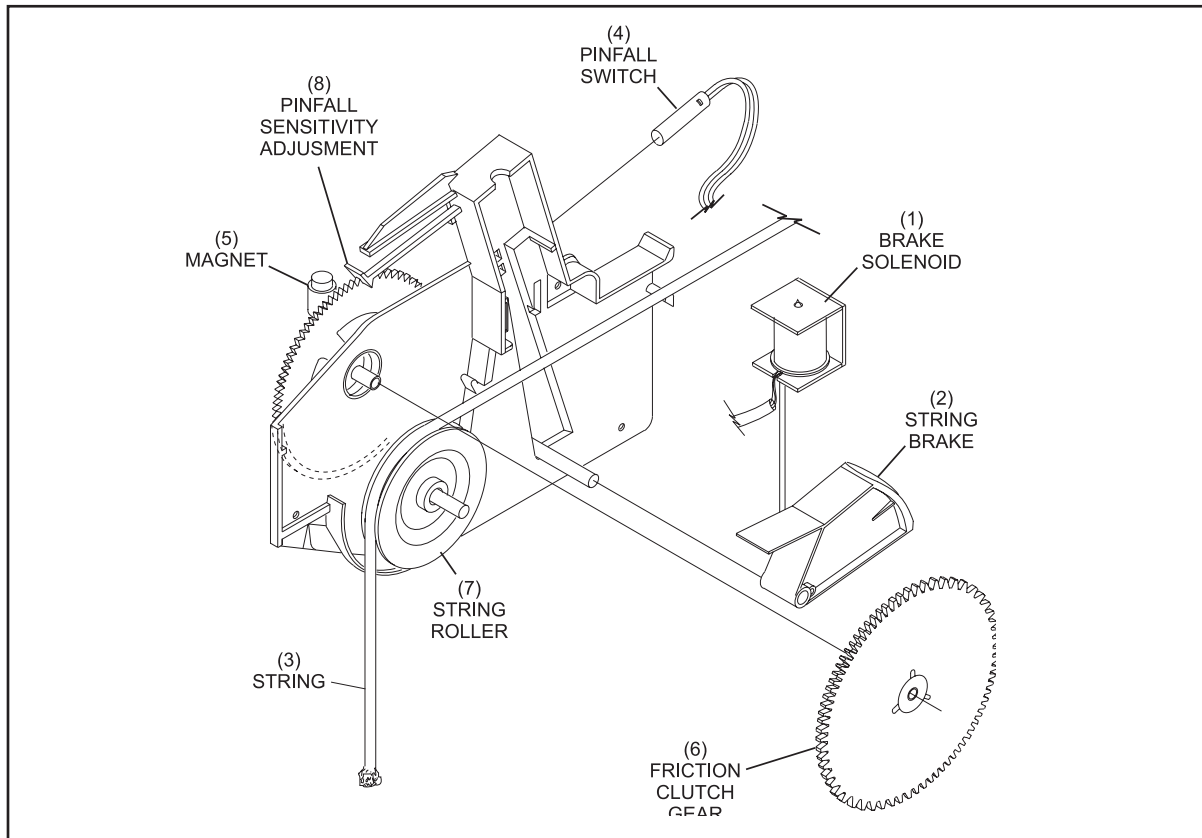


Figure 3-11. String Brake Solenoid

- | | | |
|--------------------|------------------------------------|--------------------------|
| (1) BRAKE SOLENOID | (2) STRING BRAKE | (3) STRING |
| (4) PINFALL SWITCH | (5) MAGNET | (6) FRICTION CLUTCH GEAR |
| (7) STRING ROLLER | (8) PINFALL SENSITIVITY ADJUSTMENT | |

Pinfall Switch

When a pin is knocked over, the pulling of the string causes the string roller and string gear on the SPIC to rotate. If the string pulls with enough force, a magnet attached to the string gear through a friction clutch rotates to actuate a reed type switch. A pinfall sensitivity adjustment on the SPIC determines the amount of string pull force needed by controlling the distance the magnet must rotate to actuate the switch. Refer to *Figure 3-12*.

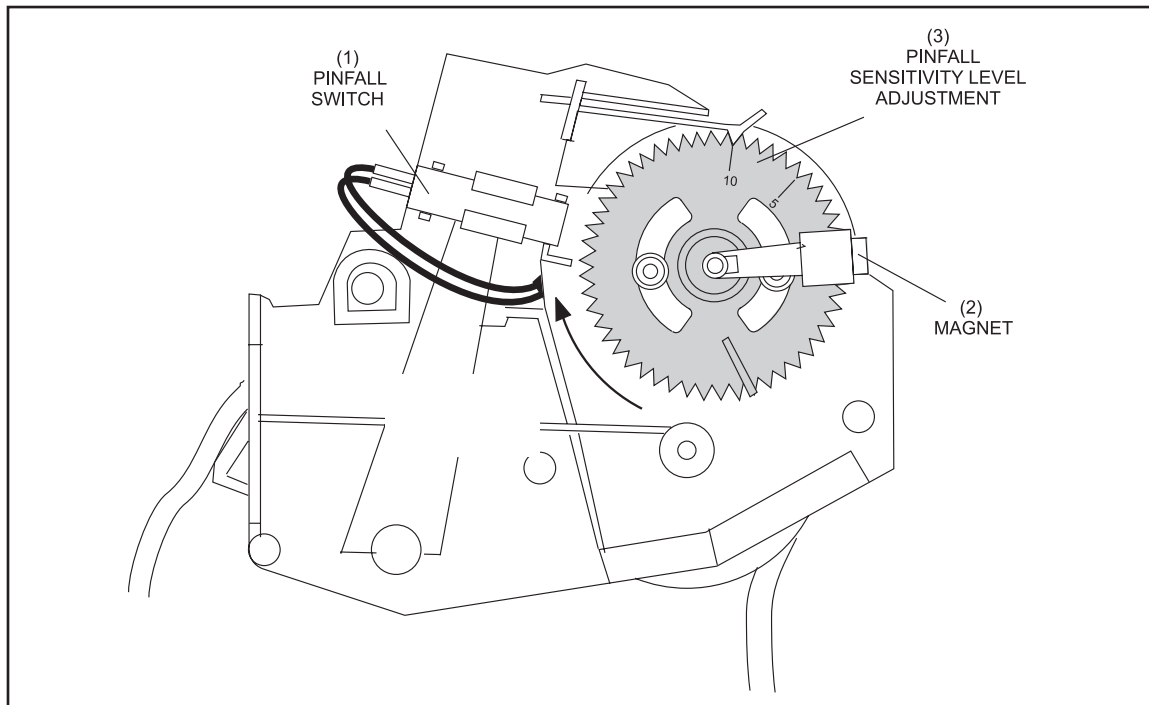


Figure 3-12. Pinfall Switch

(1) PINFALL SWITCH

(2) PINFALL SENSITIVITY
LEVEL ADJUSTMENT

(3) MAGNET

BALL DETECTORS

A ball detector is used by the to determine when a ball enters the pinsetter. Two types of detectors may be installed; one for the pinsetter electronics and one for the scoring system electronics (if installed). Refer to *Figure 3-13*.

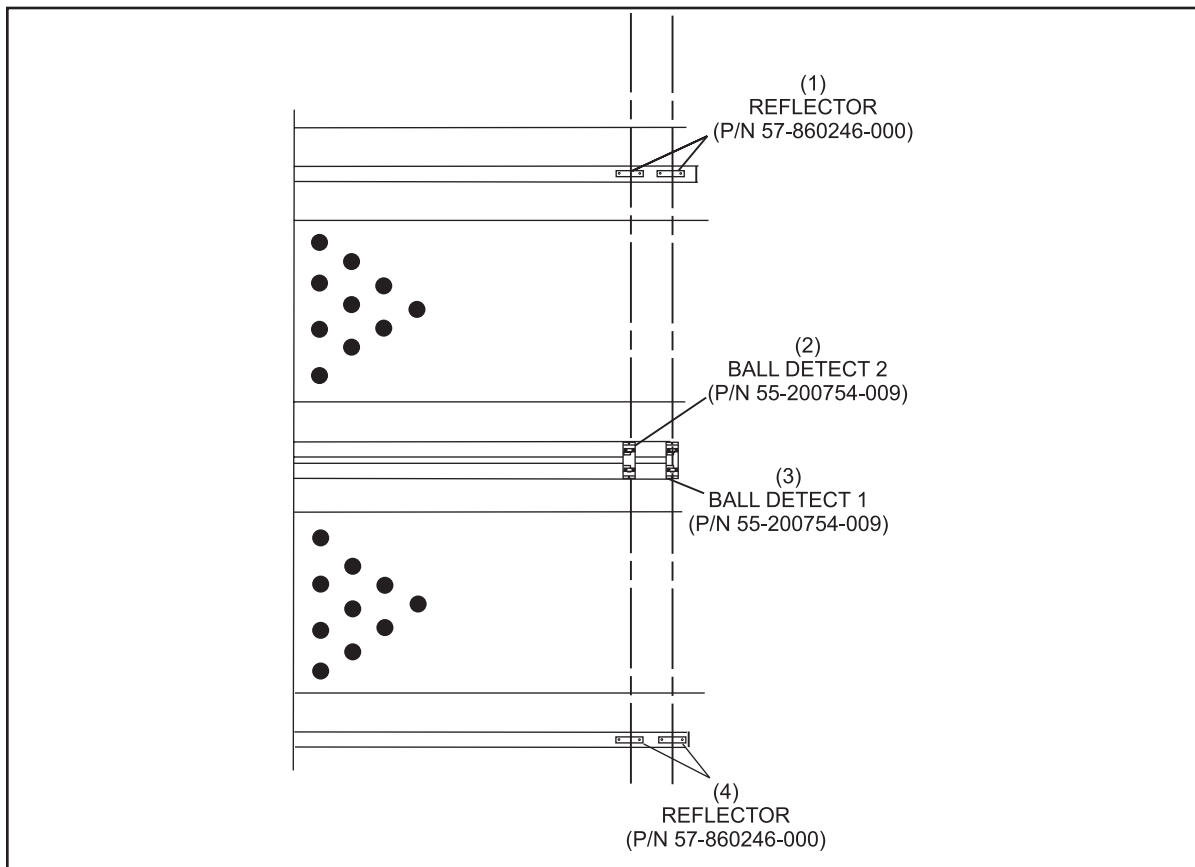


Figure 3-13. StringPin Ball Detectors

- | | | |
|---------------------------------------|--|--|
| (1) REFLECTOR
(P/N 57-860246-000) | (2) BALL DETECT 1
(P/N 55-200754-009) | (3) BALL DETECT 2
(P/N 55-200244-000) |
| (4) REFLECTORS
(P/N 57-860246-000) | | |

Pinsetter Ball Detector

The pinsetter ball detector unit is made up of an infrared transmitter and receiver. A green LED inside the unit indicates when the unit has power. A yellow LED lights to indicate when the signal is returning from the reflector. Up/down and side to side alignment adjustments are available on the unit. Refer to figure titled *Pinsetter Ball Detector*. Refer to *Figure 3-14*.

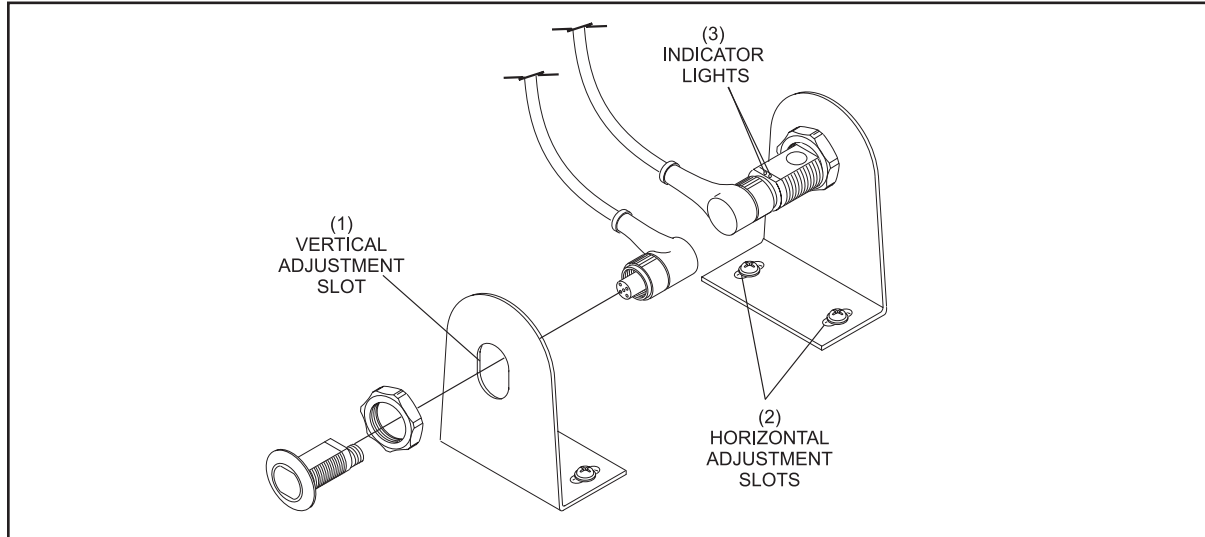


Figure 3-14. Pinsetter Ball Detector

(1) VERTICAL ADJUSTMENT SLOT

(2) HORIZONTAL ADJUSTMENT SLOTS (3) INDICATOR LIGHTS

Scoring System Ball Detector

The scorer ball detector unit is made up of two infrared transmitters and receivers, one for each lane. Within each lane unit there are two lenses, one to focus the transmitted infrared beam toward the reflector on the opposite side of the lane, and one to focus the return light from the reflector onto the infrared receiver. LEDs on the unit indicate power, signal stability and level. The provided adjustment allow the user to adjust the ball detection sensitivity. Refer to *Figure 3-15*.

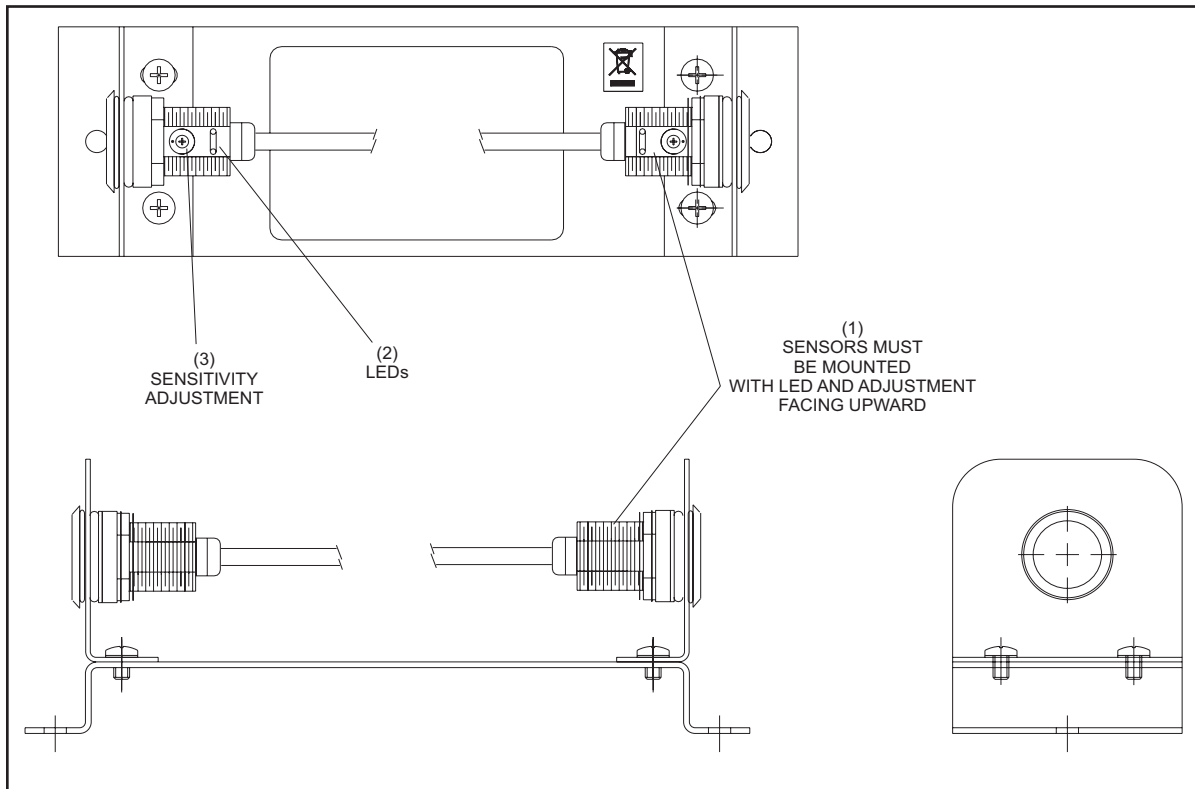


Figure 3-15. Scoring System Ball Detector

(1) SENSORS MUST BE MOUNTED
WITH LED AND ADJUSTMENT
FACING UPWARD

(2) LEDS

(3) SENSITIVITY ADJUSTMENT

Scorer Ball Detect LED Operation

Green LED (Power and Stability) - The green LED has a dual purpose. During normal operation it is used to indicate power. During calibration it indicates the signal stability. The LED will turn off when the signal level (light level) is between 90% (10% below) and 110% (10% above) of the level needed for detection. Refer to figure titled *Scoring System Ball Detector.- LED Sensitivity Chart*

i **NOTE:** When adjusting the ball detector, the green LED will turn “Off “ when the light returning from the reflector is between 90% and 110% of trigger threshold. This is normal operation.

Yellow LED (Output) - The yellow LED indicates whether the Ball Detect output has been triggered. When the detector is receiving sufficient light, the LED will be “On” to indicate that the output is not enabled (0V). When the beam is blocked the LED turns “Off” to indicate the output is enabled (+V).

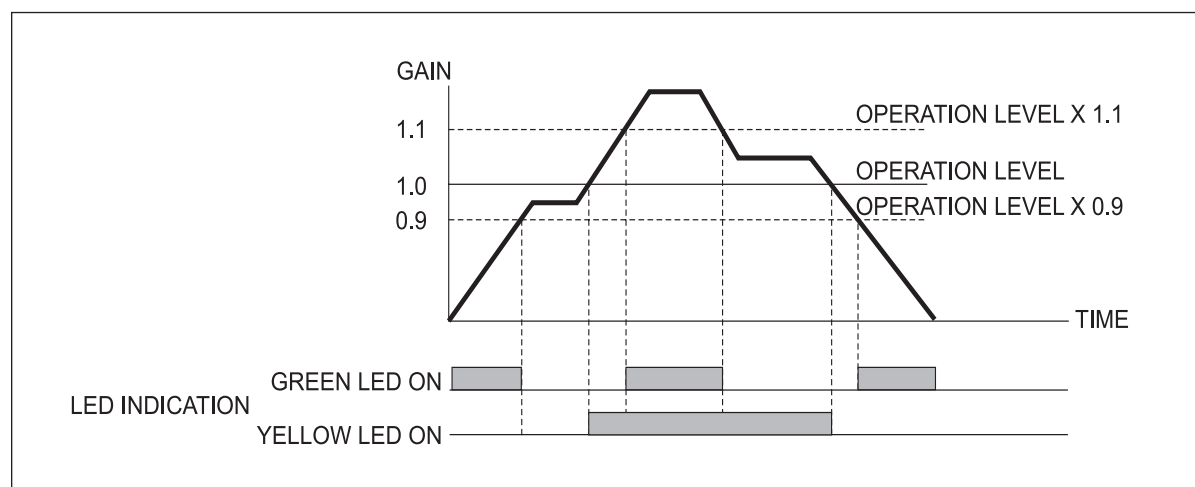


Figure 3-16. Scoring System Ball Detect - LED Sensitivity Chart

DESCRIPTION OF PINSETTER CYCLES

There are four first ball cycles and one second ball cycle. Additional cycles may be available if a scoring system is connected to the pinsetters.

First Ball Cycles

The first ball cycles include:

1. First Ball - Strike
2. First Ball - Standing Pins
3. First Ball - Short Cycle
4. First Ball - Foul

Prior to the bowler throwing a ball, the pinsetter will at its home position. Refer to *Figure 3-17*.

1. The pinsetter must be turned on, waiting for a ball.
2. The string wagon will be positioned at the front of the machine with ten pins sitting on the pin deck.
3. The magnet in the cam control box will be positioned just above the home switch.

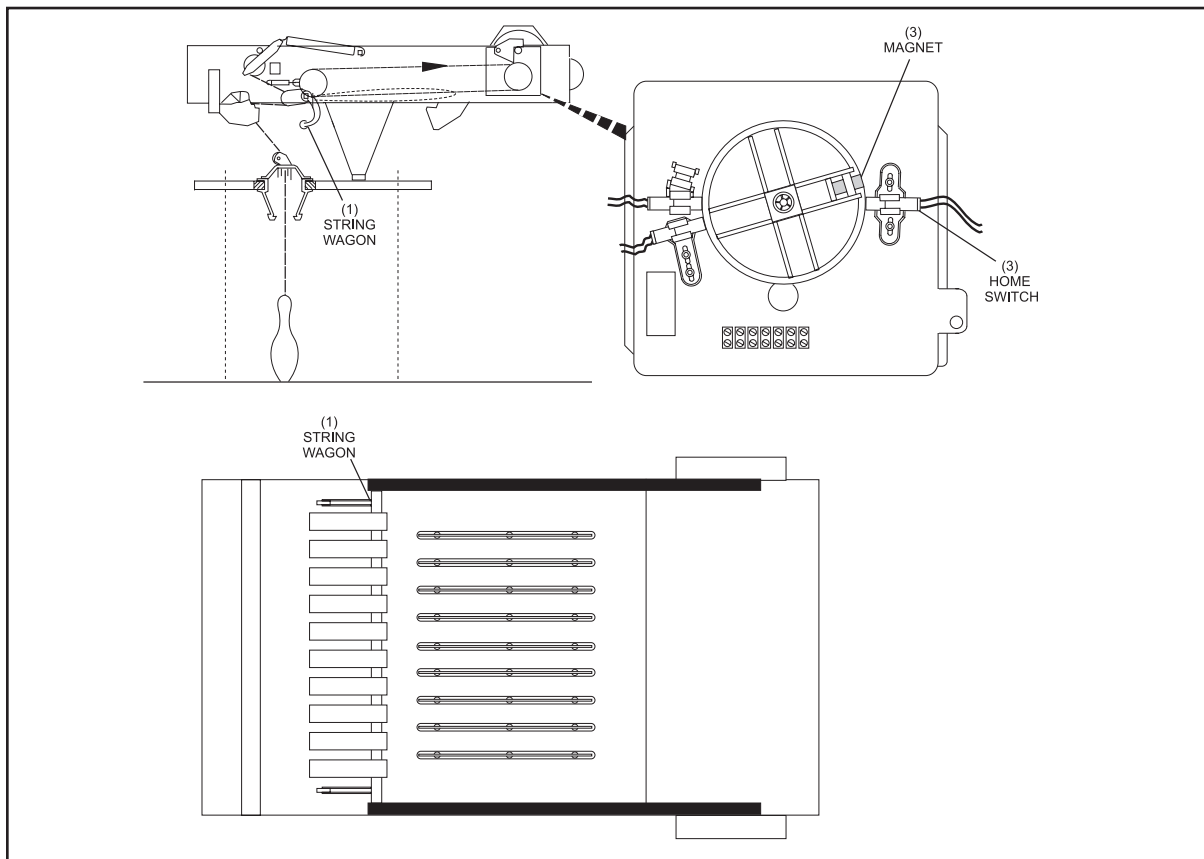


Figure 3-17. Pinsetter is Ready for Bowling

(1) STRING WAGON

(2) HOME SWITCH
(PINS ON PINDECK)

(3) MAGNET

To begin a cycle a bowler must throw a ball. The pinsetter reacts as follows: Refer to *Figure 3-18*.

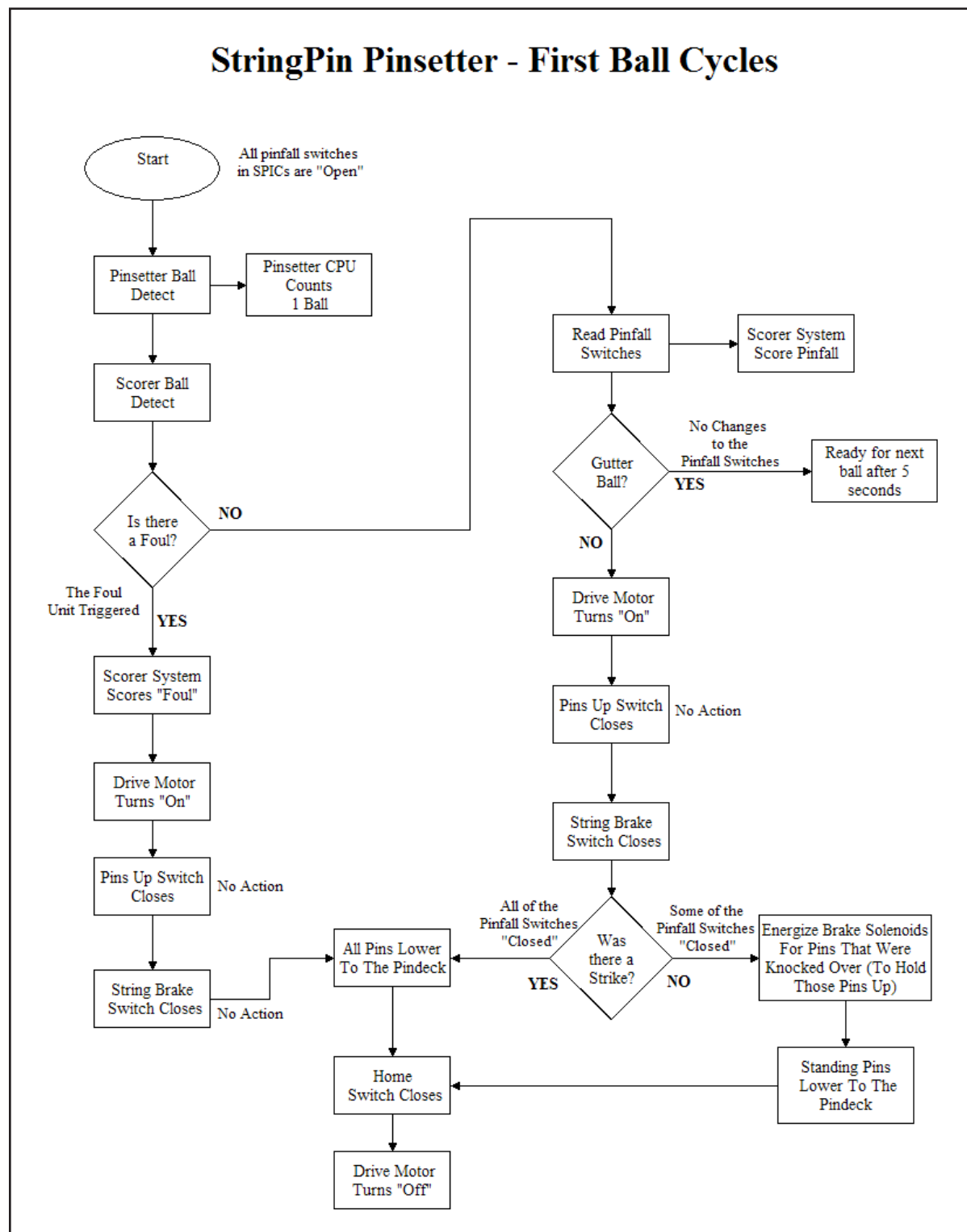


Figure 3-18. Pinsetter First Ball Cycles

Second Ball Cycle

To begin a cycle a bowler must throw a ball. The pinsetter reacts as follows: Refer to *Figure 3-19*.

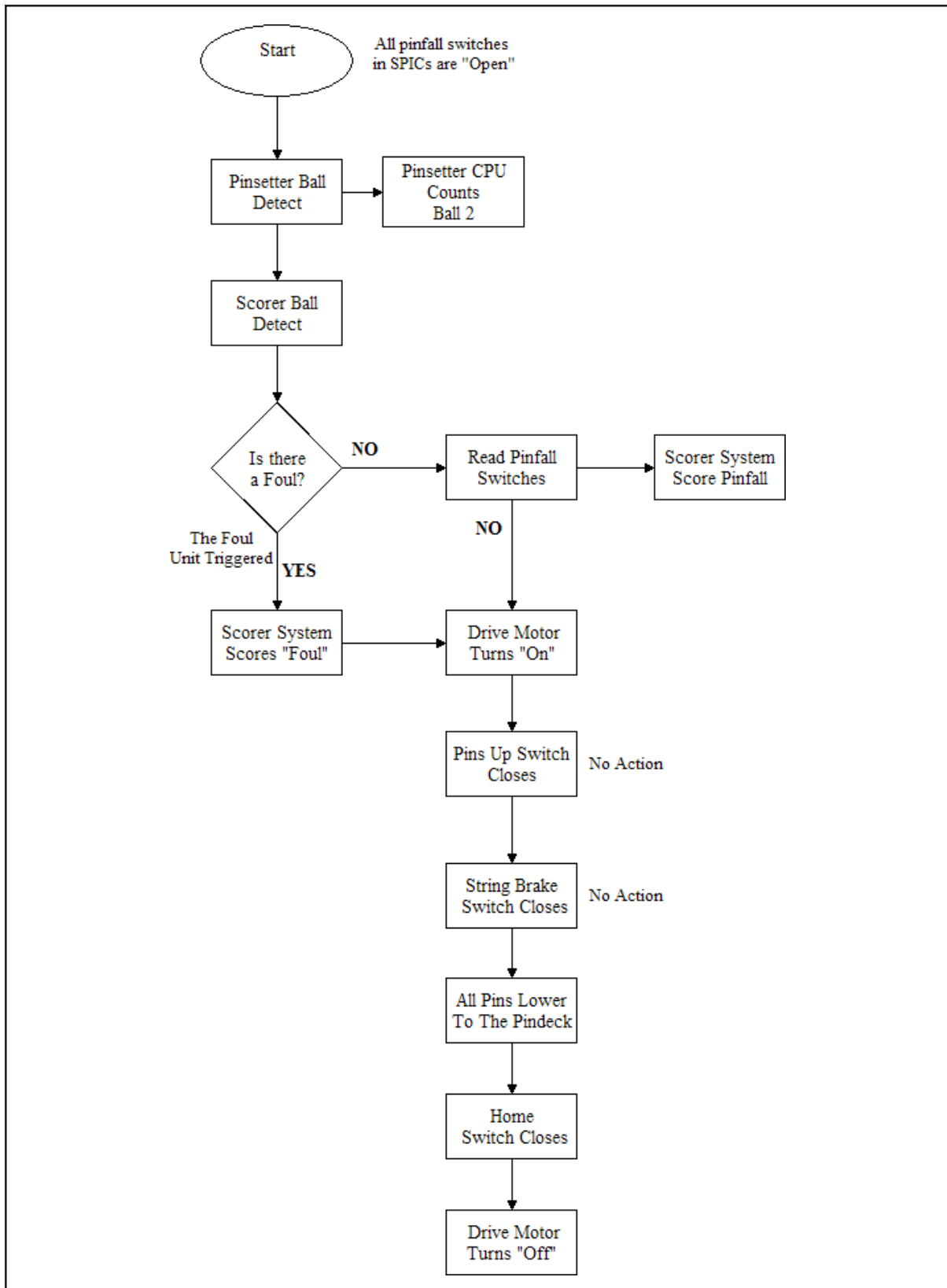


Figure 3-19. Pinsetter Second Ball Cycles

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Section 4 - Adjustments

SWITCH CLUSTER ADJUSTMENTS

Pins Up Switch Adjustment

The purpose of the Pins Up switch adjustment is to make sure that the string wagon catches on the stop dogs properly when the Pins Up push button on the StringPin Controller is pressed to raise the pins. Refer to Figure 4-1. Since the switch itself is mounted in a fixed position, the adjustment is accomplished by rotating the switch cluster gear and cam assembly.

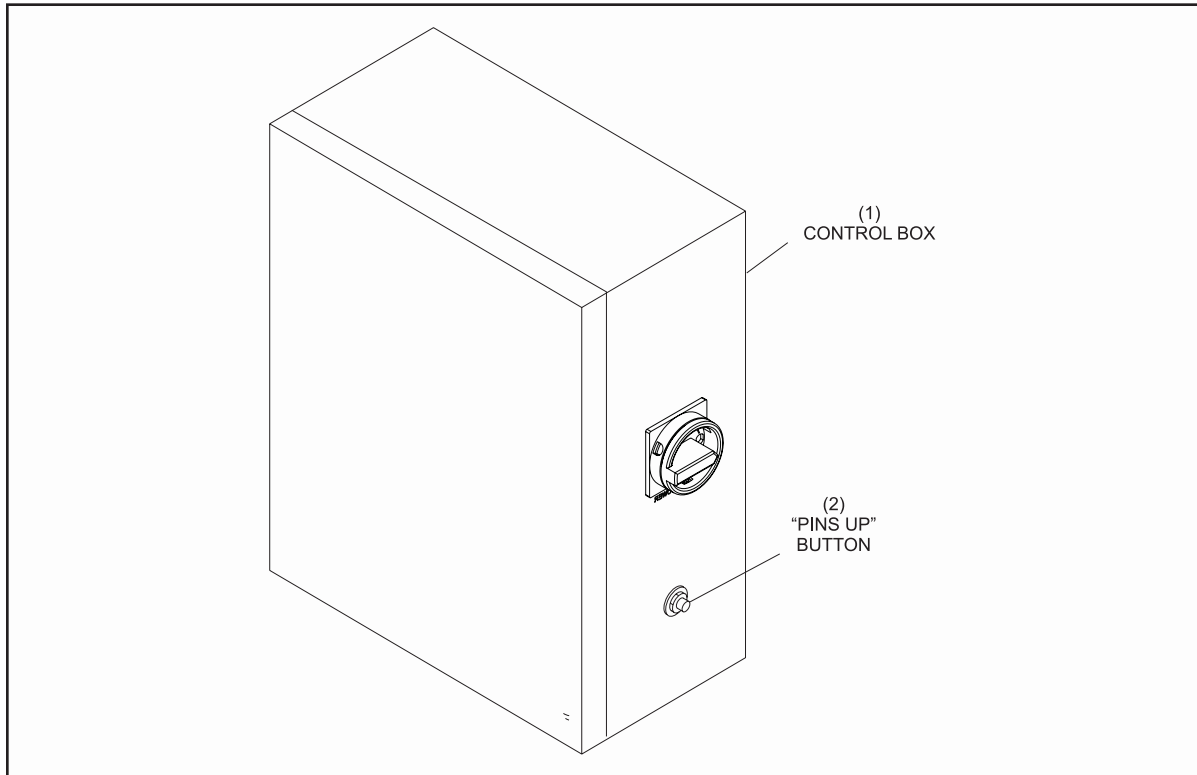


Figure 4-1. “Pins Up” Push Button

- (1) CONTROL BOX (2) “PINS UP” BUTTON

1. Press the “Pins Up” button on the side of the controller box to raise the pins to the up position. Refer to *Figure 4-1*.

i **NOTE:** The machine should bring the pins up or lower the pins to the deck every time the button is pressed. If the button does not function properly verify that the *Vector String Pinsetter Interface* box is set to “*Scorer Enabled*” or, as an alternative, the *EIN* connector on the *Pinsetter CPU* board is disconnected.

2. Observe the movement of the string wagon to determine if the wagon stops on the dogs correctly. Adjustment is required if either of the following occurs:

The wagon does not travel to the stop dogs:

- The motor will turn off, the pins will fall to the pin deck until the motors starts again. This cycle will continue until the cam is adjusted.

The wagon travel too far beyond the stop dogs:

- The motor will turn off late, and the wagon will slam back onto the stop dogs.

If neither of above conditions exists, Adjustment Is Not Needed.

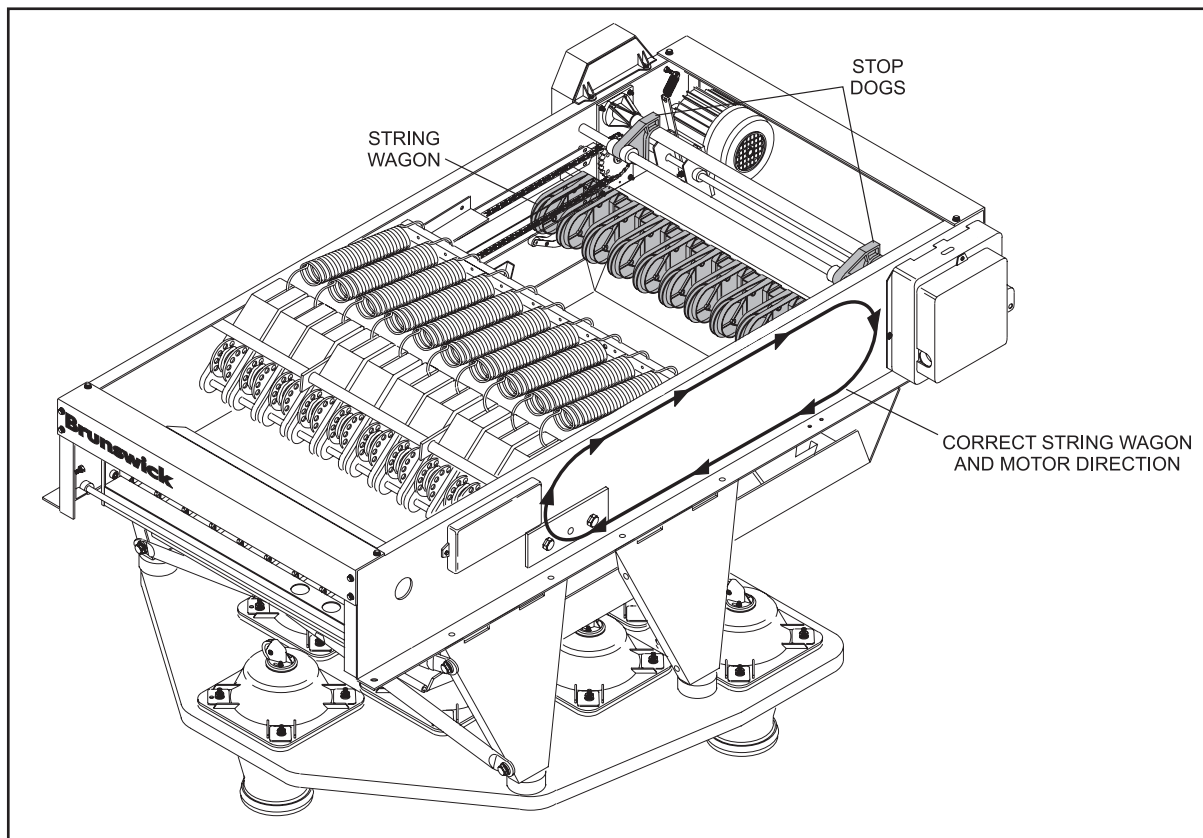


Figure 4-2. Cycle Machine

- | | | |
|------------------|---------------|--------------------------------------|
| (1) STRING WAGON | (2) STOP DOGS | (3) DESIRED STOPPING POINT FOR WAGON |
|------------------|---------------|--------------------------------------|

3. If adjustment is needed, turn the pinsetter off using either of the Run/Stop or the main power switch.

4. Remove the cover from the switch cluster assembly.
5. Loosen the (3) screws for the Cam Control Box. Refer to *Figure 4-3*.

i **NOTE:** DO NOT REMOVE THE SCREWS. The screws only need to be loose to manually adjust cam.

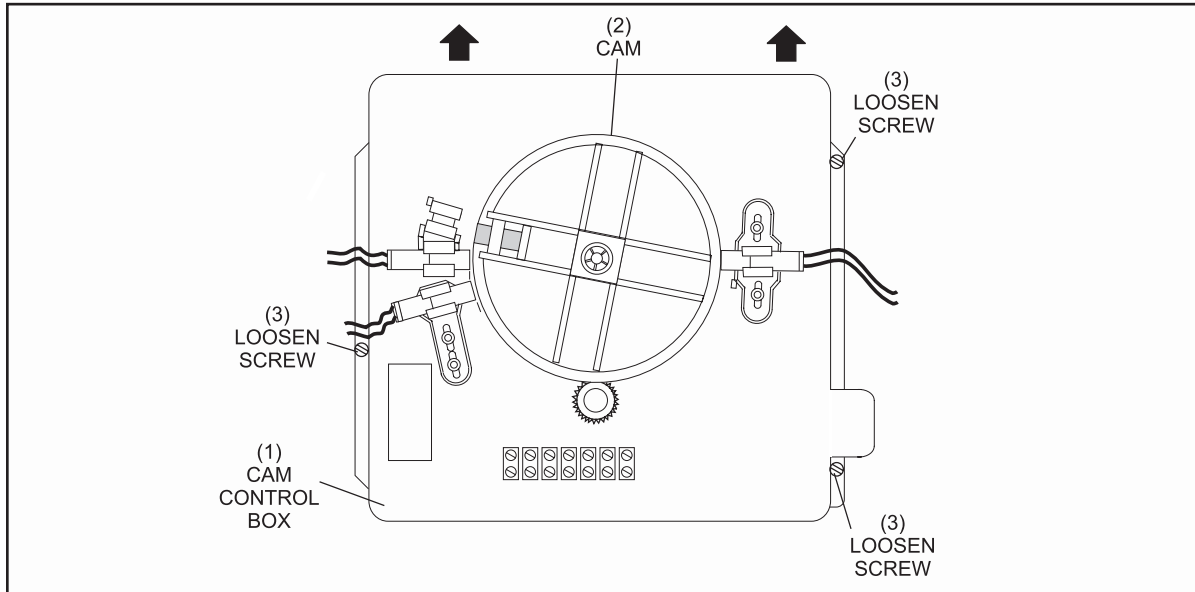


Figure 4-3. Cam Mounting Screws

(1) CAM CONTROL BOX

(2) CAM

(3) LOOSEN SCREWS

6. Push the Cam Control Box UP to rotate the cam as needed based on the operation observed in step 2. Refer to *Figure 4-4*.

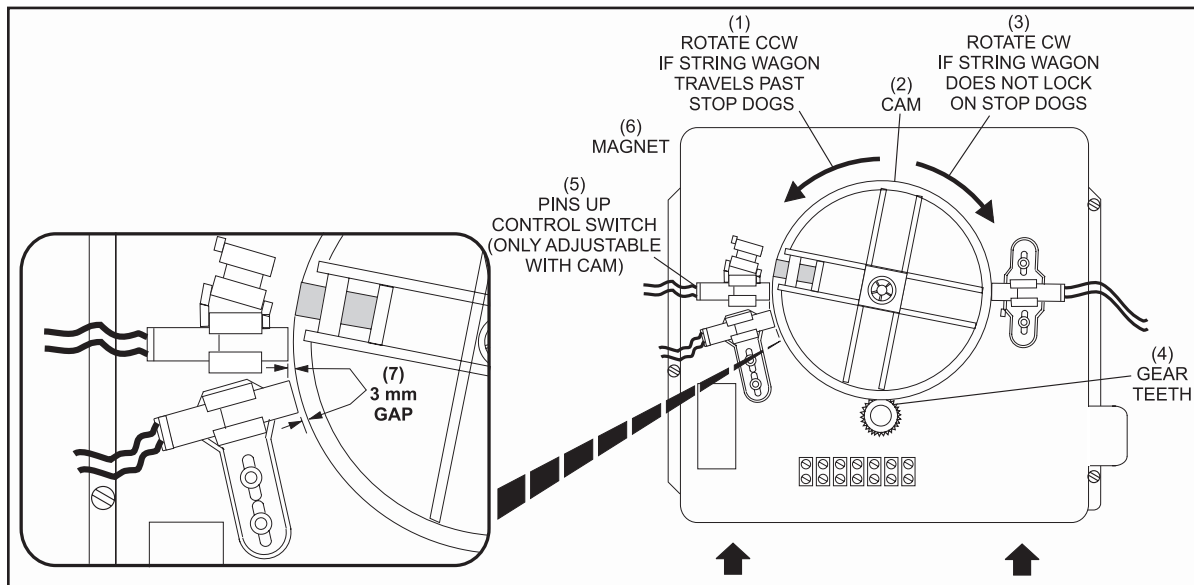


Figure 4-4. Rotate Cam.

- | | | |
|---|---|--|
| (1) ROTATE CCW IF STRING WAGON TRAVELS PAST STOP DOGS | (2) CAM | (3) ROTATE CW IF STRING WAGON DOES NOT LOCK ON STOP DOGS |
| (4) GEAR TEETH | (5) PINS UP CONTROL SWITCH (ONLY ADJUSTABLE WITH CAM) | (6) MAGNET |
5. After the cam is adjusted in the proper direction, lower the cam down to align with gear teeth. Refer to *Figure 4-4*. Tighten the three screws loosened in step 5.
 6. Turn the power on and cycle pins using the pin up switch. Repeat Cam Adjustment until string wagon locks interacts properly with the stop dogs.
 7. Re-install the switch cluster cover removed in step 4.

Home Switch Adjustment

The home switch determines when to turn off the drive motor after setting new pins on the pindeck. This switch is factory set and does not normally need adjustment.

Perform the following steps to verify the switch is set properly.

1. Cycle the pins so all 10 pins are on the pindeck.
2. Check the position of the string wagon. It should stop at the front of the machine between the end of the string guides and front chain gear
3. If adjustment is needed, loosen the switch mounting screws and position the switch as desired. Refer to *Figure 4-5*.

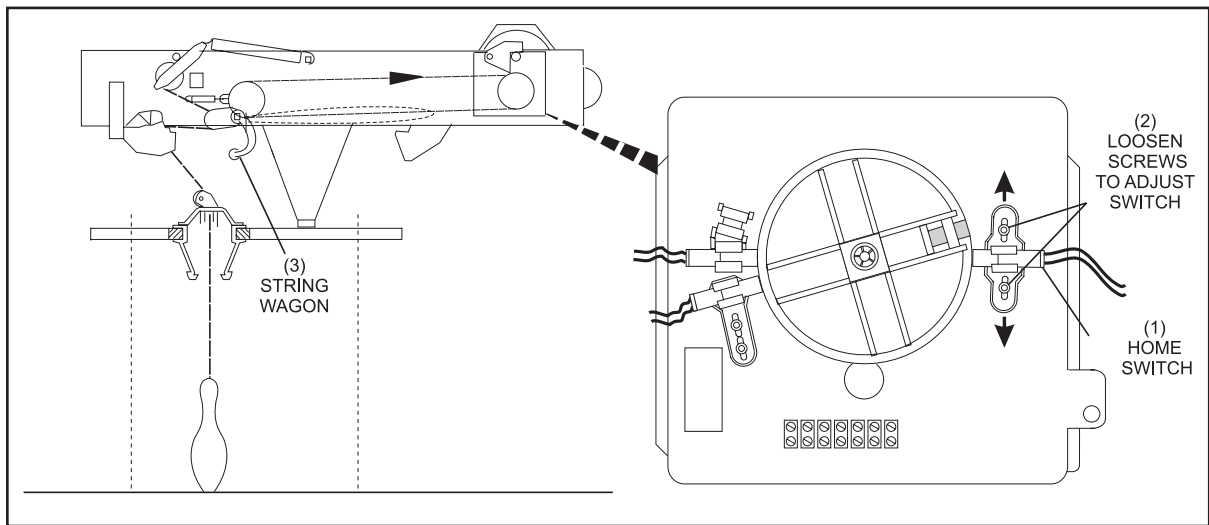


Figure 4-5. String Wagon Position and Home Switch Adjustment

- | | | |
|----------------|---------------------------------------|------------------|
| 1) HOME SWITCH | (2) LOOSEN SCREWS TO
ADJUST SWITCH | (3) STRING WAGON |
|----------------|---------------------------------------|------------------|

String Brake Switch Adjustments

The string brake switch determines when to energize the solenoid in the SPIC so that the pins that were knocked over on first ball cycles are not lowered back onto the pindeck.

1. With the pinsetter power on, knock over some pins. The machine will cycle and should keep the knocked over pins in the up position.
2. Turn the pinsetter power off and lockout the power on/off switch.



Warning! Pinsetter power is to remain off while performing any manual function.

3. Check the movement of a raised pin in the pin centering cone by pulling on its string. The travel distance of the pin should be $80 \text{ mm} \pm 20 \text{ mm}$. Refer to *Figure 4-6*.

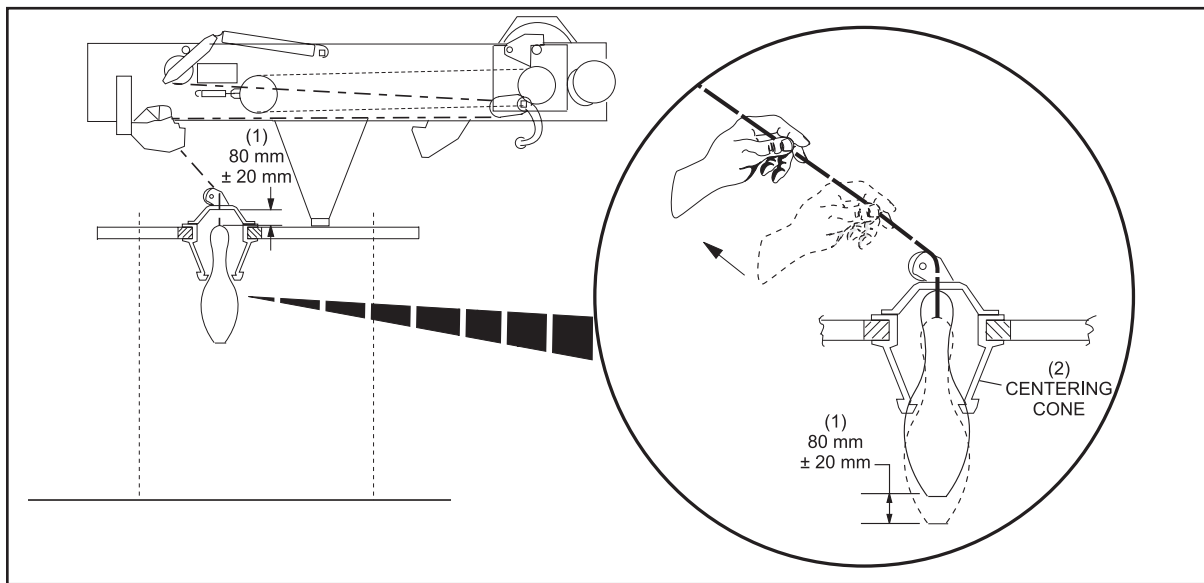


Figure 4-6. String Brake Adjustment

(1) $80 \text{ mm} \pm 20 \text{ mm}$

(2) CENTERING CONE

4. Adjust the String Brake switch up or down, as needed, to obtain the appropriate pin movement. Refer to *Figure 4-7*.

i **TIP:** If the pin travel is greater than 100 mm, move the string brake switch upward. If the travel is less than 60 mm, move the string brake switch downward.

5. Repeat steps 1-4 to verify pin movement in pin centering cone.

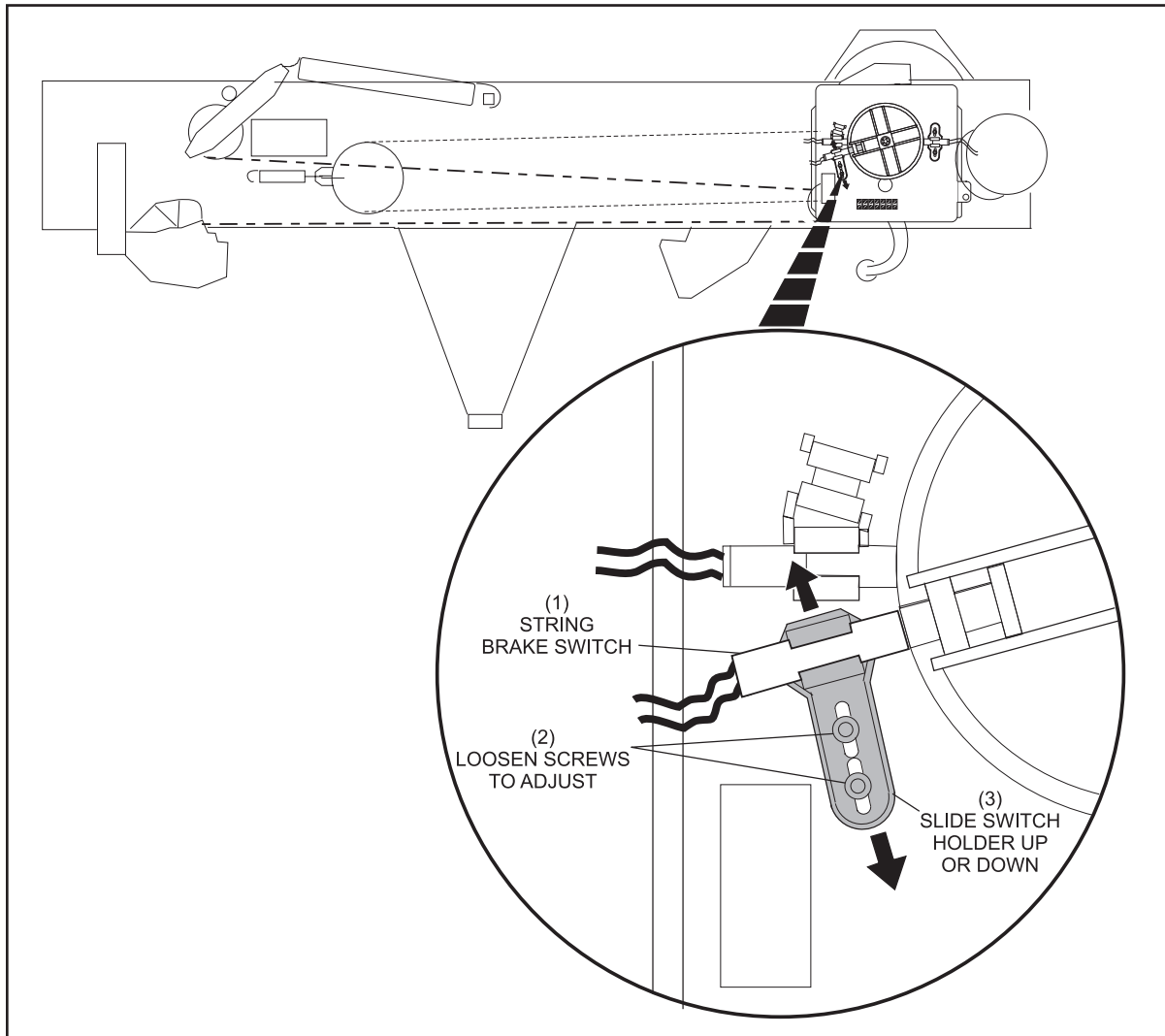


Figure 4-7. Adjust Brake Switch

(1) STRING BRAKE SWITCH

(2) LOOSEN SCREWS TO
ADJUST

(3) SLIDE SWITCH HOLDER UP OR
DOWN

STRING TENSION ADJUSTMENT

The string tension adjustment determine the amount of string that is in use during normal operation. The adjustment is accomplished by rotating the string spool to let more (or less) string out of the spool.

i **NOTE:** *The string for the pins will stretch over time. This adjustment will have to be checked after the string has stretched.*

1. Press the “Pins Up” button on the side of the controller box to raise the pins to the up position and lock the string wagon on the stop dogs. Refer to *Figure 4-1*.

i **NOTE:** *The machine should bring the pins up or lower the pins to the deck every time the button is pressed. If the button does not function properly verify that the Vector String Pinsetter Interface box is set to “Scorer Enabled” or, as an alternative, the EIN connector on the Pinsetter CPU board is disconnected.*

2. Observe the distance (gap) between the tension limiter bar the each of the ten tension levers. The should be a distance (gap) of 1 mm - 5mm between the limiter bar and the tension lever. Refer to *Figure 4-8*.
3. If the tension adjustment is required for any of the pins Refer to *Figure 4-8*;
 - a. Slide the string spool away from locking pins to release the spool reel.
 - b. Rotate the string reel as needed to obtain the 1-5 mm gap between the limiter bar and the tension lever.
 - c. When the proper gap has been obtained, move the string reel to the right rotating it as required to align its holes with locking pins.

i **NOTE:** *Rotating the spool towards the back of the machine will reduce the tension and gap. Rotating the spool toward the front of the machine will increase the tension and gap. Refer to *Figure 4-8*.*

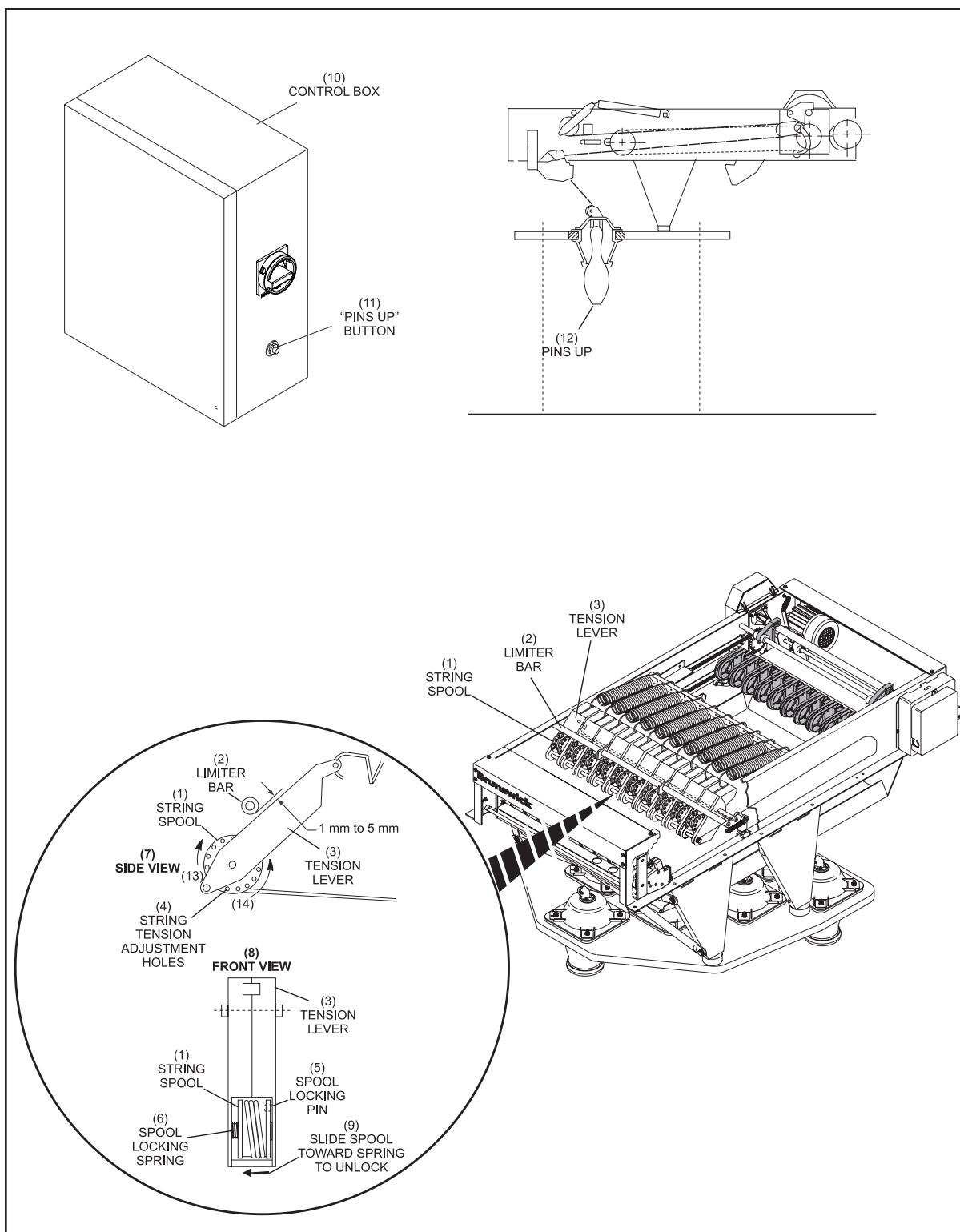


Figure 4-8. String Tension Adjustments

- | | | |
|--|------------------------|-------------------------------------|
| (1) STRING SPOOL | (2) LIMITER BAR | (3) TENSION LEVER |
| (4) SPRING TENSION
ADJUSTMENT HOLES | (5) SPOOL LOCKING PINS | (6) SPOOL LOCKING SPRING |
| (7) SIDE VIEW | (8) FRONT VIEW | (9) SLIDE SPOOL TOWARD
TO UNLOCK |
| (10) CONTROL BOX | (11) "PINS UP" BUTTON | (12) PINS UP |

PIN DETECTION ADJUSTMENT

The pin detection adjustment ensures the pinsetter identifies only pins that have been knocked over as fallen pins. If this adjustment is incorrect the machine could identify a pin that was moved off spot, but did not fall as a knocked over pin. The pin detection adjustment is accomplished using a SPIC adjustment call sensitivity which changes the distance the magnet on the SPIC must travel to actuate the pinfall switch. Because of the design, re-adjustment from the factory setting is seldom required.

The adjustment gear is marked every fifth tooth with numbers 1, 5, 10, and 15 with 1 being the most sensitive position. A locking clip keeps the gear from rotating. To adjust the sensitivity lift the locking clip and rotate the gear to the desired setting. The recommended sensitivity level setting is 10. Refer to *Figure 4-9*.

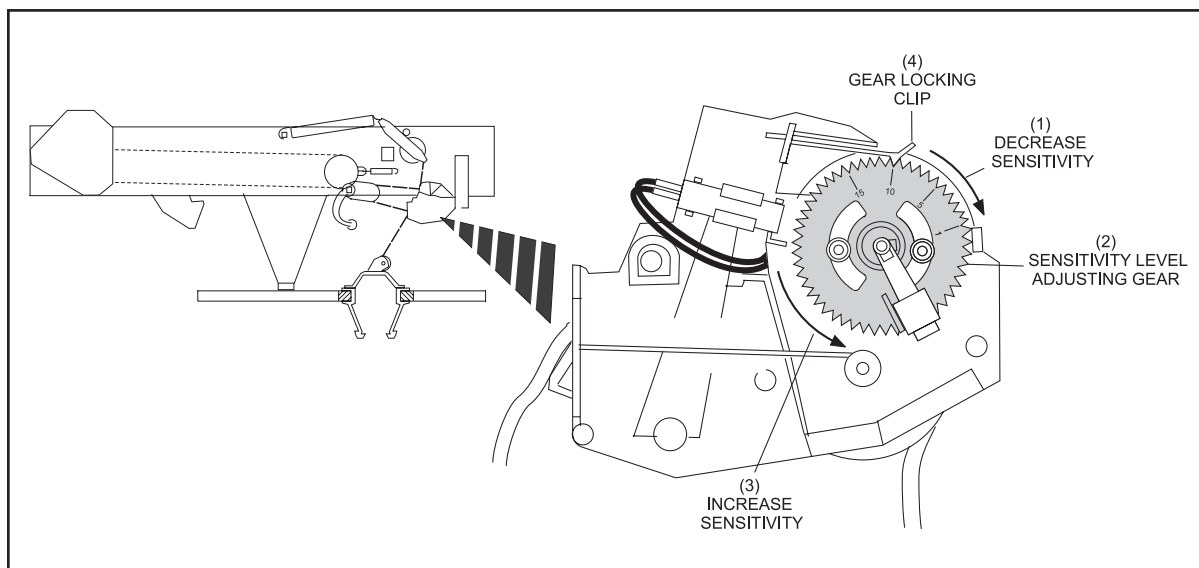


Figure 4-9. Adjust Sensitivity

(1) INCREASE SENSITIVITY

(2) SENSITIVITY LEVEL
ADJUSTING GEAR

(3) DECREASE SENSITIVITY

(4) GEAR LOCKING CLIP

i **TROUBLE SHOOTING TIP:** *Sometimes the pinfall reed switch will provide a false signal because the magnet becomes stuck or caught and stays on the reed switch. To correct this issue, verify the magnet is not broken and rotate magnet away from the reed switch.*

PIN SLOW SETTING ADJUSTMENTS

1. Turn the pinsetter power on. Knock down some pins. When the string wagon travels to the rear of the string pinsetter, turn off the pinsetter power. The pins will travel to the pindeck by gravity.
2. Lock out power to the pinsetter..



Warning! Pinsetter power is to remain off while performing any manual function.

3. Manually rotate the large drive pulley in reverse until the string wagon lever roller starts to touch the inside of the pin slow setting bracket. Refer to Figure 4-10.
4. Lock the large drive pulley at this position
5. Measure the distance the bottom of pins 1-3 & 5 are from the pin deck. The distance should be 60 mm $\pm$ 20 mm. Measure the distance the bottom of pins 4, 6 and 7-10 are from the pin deck. The distance should be 80 mm $\pm$ 20 mm.
6. If the distance is greater than 80 mm or 100 mm adjust the pin slow setting brackets forward. If the distance is less than 40 mm or 60 mm adjust the pin slow setting brackets rearward.

i **NOTE:** The position of the brackets must be the same on both sides of the machine.

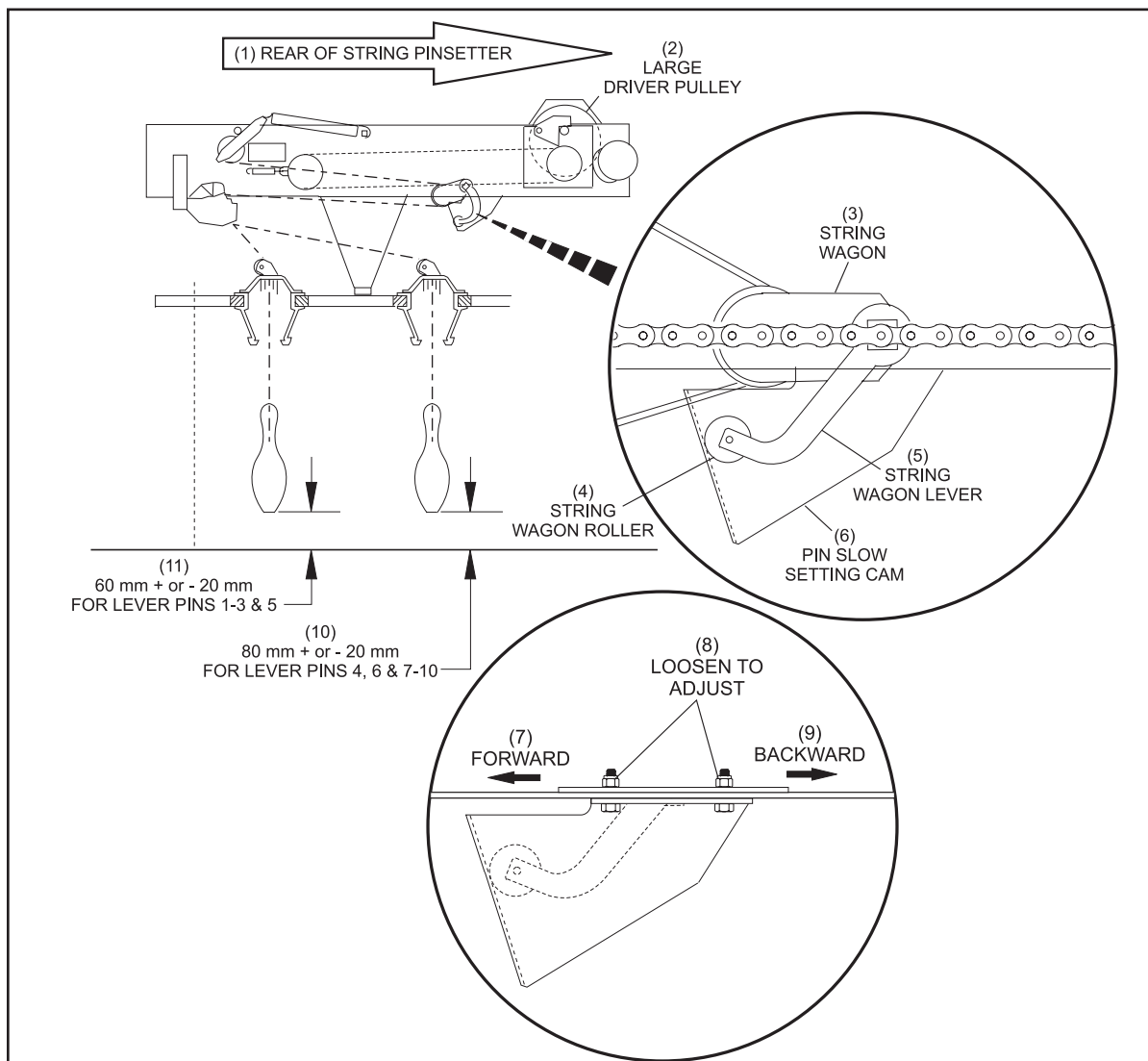


Figure 4-10. Slow Setting Adjustment

- | | | |
|------------------------------|-----------------------------|--------------------------|
| (1) REAR OF STRING PINSETTER | (2) LARGE DRIVER PULLEY | (3) STRING WAGON |
| (4) STRING WAGON ROLLER | (5) STRING WAGON LEVER | (6) PIN SLOW SETTING CAM |
| (7) FORWARD | (8) LOOSEN TO ADJUST | (9) BACKWARD |
| (10) 80 mm + OR - 20 mm | (11) 60 mm + OR - 20 mm FOR | |
| FOR LEVER PINS 4, 6 AND 7-10 | LEVER PINS 1-3 AND 5 | |

BALL ACCELERATOR FLAT BELT ADJUSTMENT

Flat Belt Tension

A large tension spring at the front of the accelerator provides the tension for the flat belt. When the belt is under proper tension, this spring will be approximately 185 mm from spring hook to spring hook. Refer to *Figure 4-11*. Adjust by tightening or loosening the two tensioning nuts that secure the long tension bar to the rear of the accelerator frame. Adjust the nuts so that the tension bar threads extend 50mm beyond the outside tension nut.

i **NOTE:** Access to the spring is only possible when the accelerator is removed from the ball box..

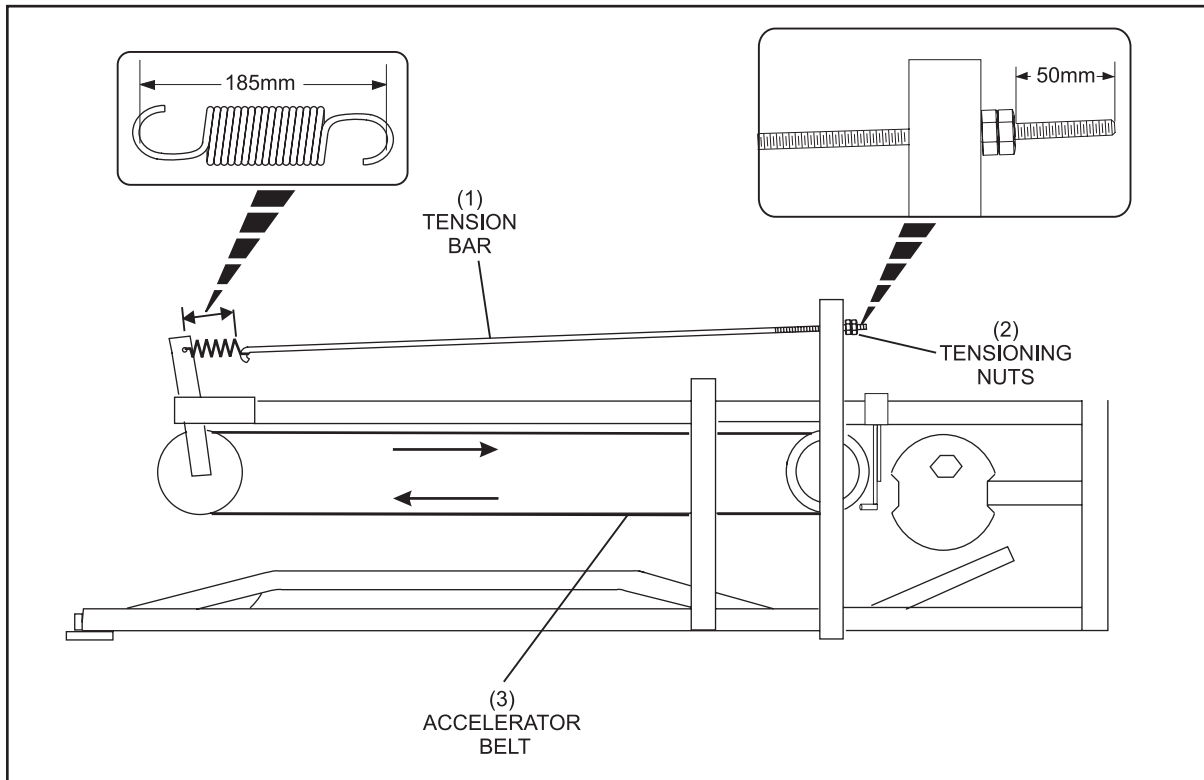


Figure 4-11. Ball Accelerator Flat Belt Tension Adjustment.

(1) TENSION BAR

(2) TENSIONING NUTS

(3) ACCELERATOR BELT

Belt Alignment

i **NOTE:** It is recommended that two people perform the following procedure; one to control power to the accelerator, and one to perform belt tracking adjustment as needed.

i **WARNING:** The following procedure involves making adjustments to the accelerator with power on and requires close proximity to moving machine parts. Use extreme caution around moving belt to prevent injury to personnel! DO NOT wear loose fitting clothes which may be caught in moving belt!

1. Plug in accelerator power cord and observe belt tracking on front pulley drum.
2. Disconnect the accelerator power cord.
3. If the belt is not centered on the front pulley drum:
 - a. Using a 17 mm socket, ratchet and wrench, loosen the two screws and nuts securing the pivot levers. ONLY loosen screws enough to allow slight adjustment of pivot levers. Refer to Figure 4-12.

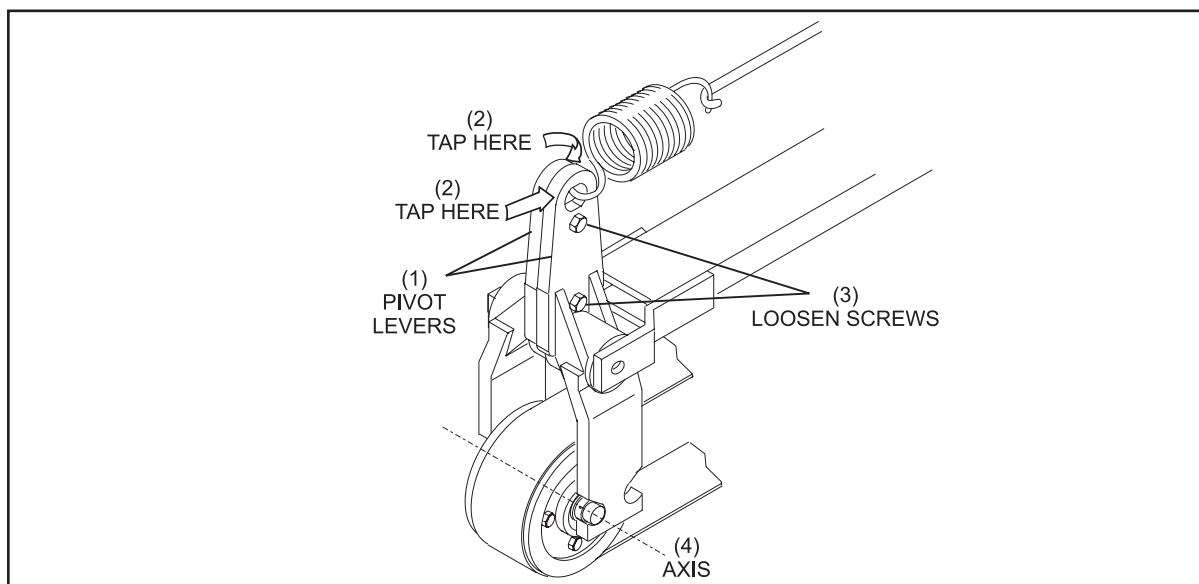


Figure 4-12. Loosen Hardware Securing Pivot Levers.

(1) PIVOT LEVERS
(4) AXIS

(2) TAP HERE

(3) LOOSEN SCREWS

i **WARNING:** When making adjustments, use care to prevent the belt from slipping off the pulley drum surface. This could damage pivot levers and possibly injure personnel!

- b. Rotate the belt by hand and observe belt tracking. Use light, short taps from a soft rubber mallet to reposition left and right pivot levers until belt is tracking on the center of pulley drum. Refer to Figure 4-12.
 - c. Reconnect the accelerator power cord and observe the tracking. When the belt is centered, tighten two screws and nuts securing the pivot levers.

PINSETTER - BALL DETECT ADJUSTMENT

The pinsetter ball detector unit is made up of an infrared transmitter and receiver. A green LED inside the unit indicates when the unit has power. A yellow LED lights to indicate when the signal is returning from the reflector. Up/down and side to side alignment adjustments are available on the unit. Refer to figure titled *Pinsetter Ball Detector*. Refer to *Figure 4-13*.

1. To align the ball detector, move the unit left/right (horizontal) or up/down (vertical) until the yellow indicator light is solidly “On”. To adjust vertically, loosen the threaded nut holding the ball detect to the bracket and slide the unit up/down. To adjust horizontally, loosen the metal bracket mount screws. Once in the desired position, retighten the mounting nut or mounting screws.. Refer to figure 4-13 titled Pinsetter Ball Detector.

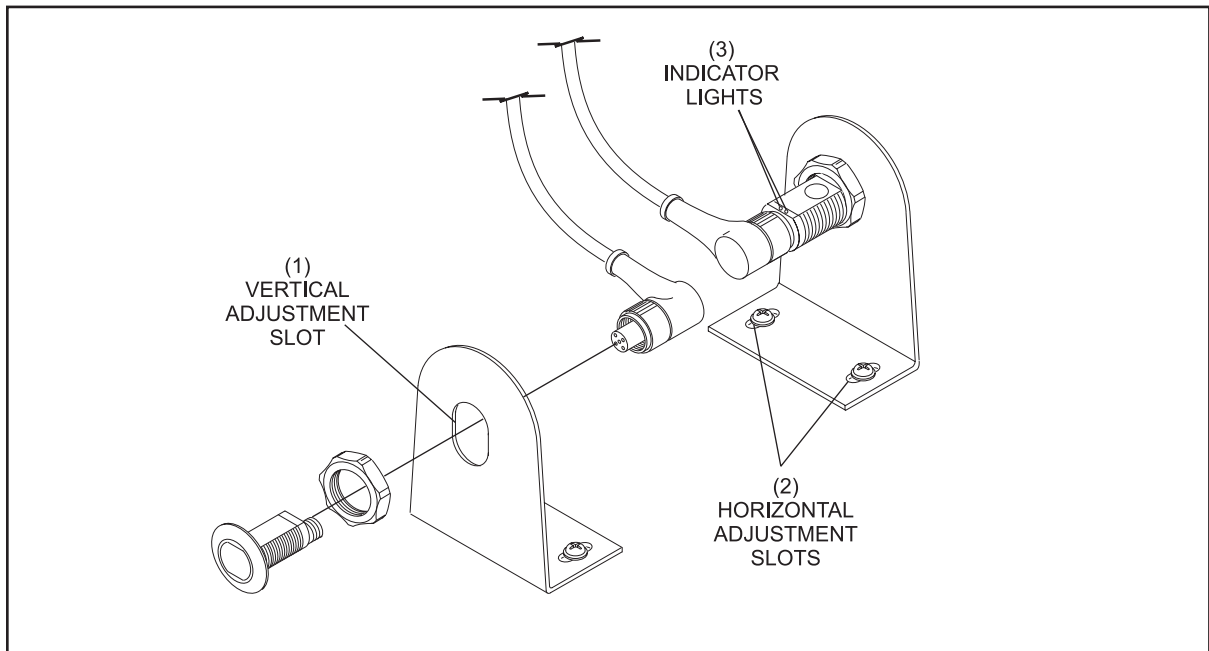


Figure 4-13. Pinsetter Ball Detector

- (1) VERTICAL ADJUSTMENT SLOT (2) HORIZONTAL ADJUSTMENT SLOTS (3) INDICATOR LIGHTS

SCORER - BALL DETECT CALIBRATION INSTRUCTIONS

1. Turn the sensitivity adjustment fully CCW. The yellow LED will be “Off” and the Green LED will be “On”. Refer to figure 4-14 titled *Sensitivity Adjustment 1*.

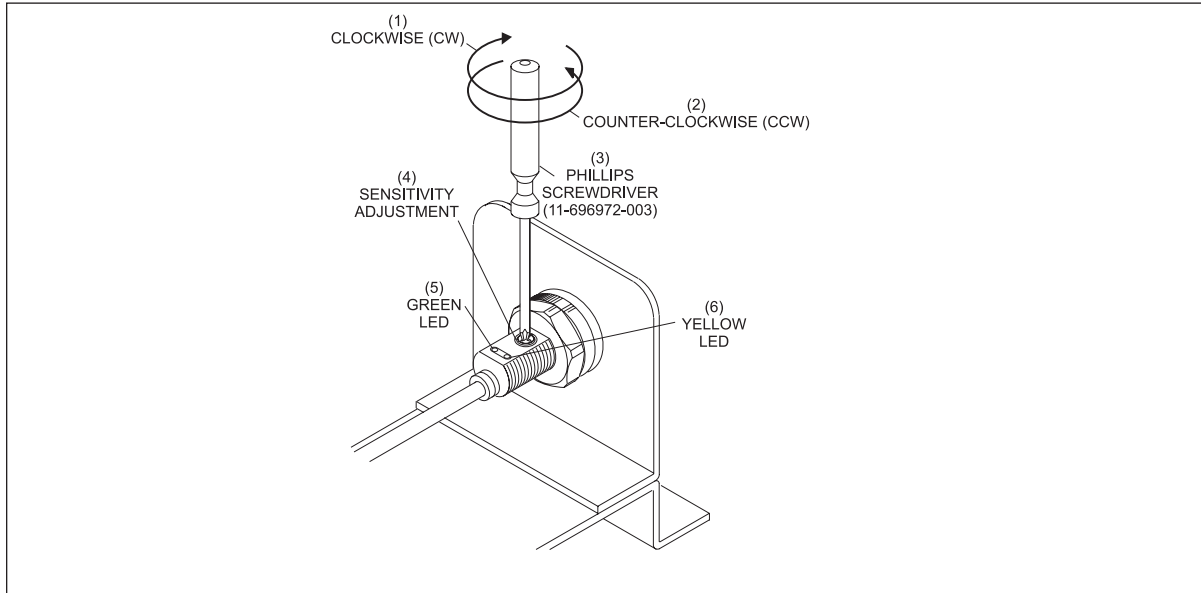


Figure 4-14. Sensitivity Adjustment 1

- | | | |
|----------------------------|-----------------------------|--|
| (1) CLOCKWISE (CW) | (2) COUNTER-CLOCKWISE (CCW) | (3) PHILLIPS SCREWDRIVER (11-696972-003) |
| (4) SENSITIVITY ADJUSTMENT | (5) GREEN LED | (6) YELLOW LED |

2. Turn the sensitivity adjustment CW, very slowly until both LEDs turn “On”. Refer to figure titled *Sensitivity Adjustment 1*.

i **NOTE:** When adjusting the ball detector, the green LED will turn “Off”, the Yellow LED will turn “On”, then the Green LED will turn back “On”. This is normal operation.

3. Once both the green and yellow LEDs are “On”, turn the sensitivity adjustment CW an additional 1/8 turn. Refer to figure titled *Sensitivity Adjustment 2*

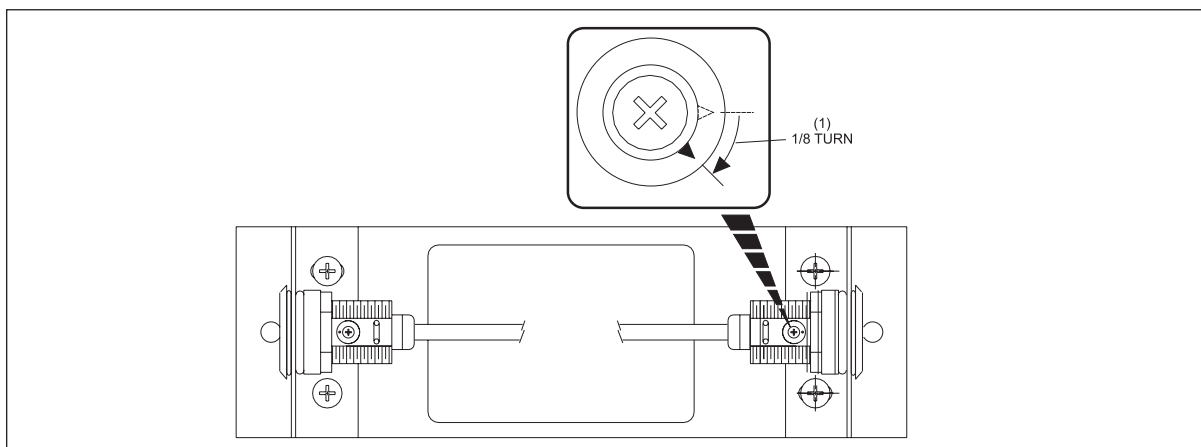


Figure 4-14. Sensitivity Adjustment 2

- (1) 1/8 TURN

Section 5 - Maintenance & Service

MAINTENANCE



WARNING! When performing any maintenance, make sure the main power is turned off and the power plug has been disconnected.

Rotating Pins

i **NOTE:** Pins should be inspected once a week.

Rotating pins in the 1 through 10 positions is necessary for long life of bowling pins. The rotation interval will depend on the usage of the lanes and the type of bowlers.

Pin Strings

Pin String Inspection

i **NOTE:** Strings should be inspected at least once a week.

Check the strings for wear, paying particular attention to the area at the head of the pin. If there is a sufficient amount of reserve string in the string spool, the worn section of the string can be removed and replaced with some of the reserve. In the event the amount of reserve string in the spool is not sufficient, the new string must be installed on the machine.

Repairing Worn String

1. Unwind a length of string from the String Spool similar to the length of string that needs to be replaced.
2. From under the pin table, pull the string through the machine towards the pin.
3. Cut the string at the String Spool side of the damage. Pull the damaged string through the pin and discard.
4. Thread the “new” string through the head of the pin and tie a knot in the end of the string. Leave approximately 1/2” (13 mm) of string extending beyond the end of the knot. Refer to *Figure 5-1*.

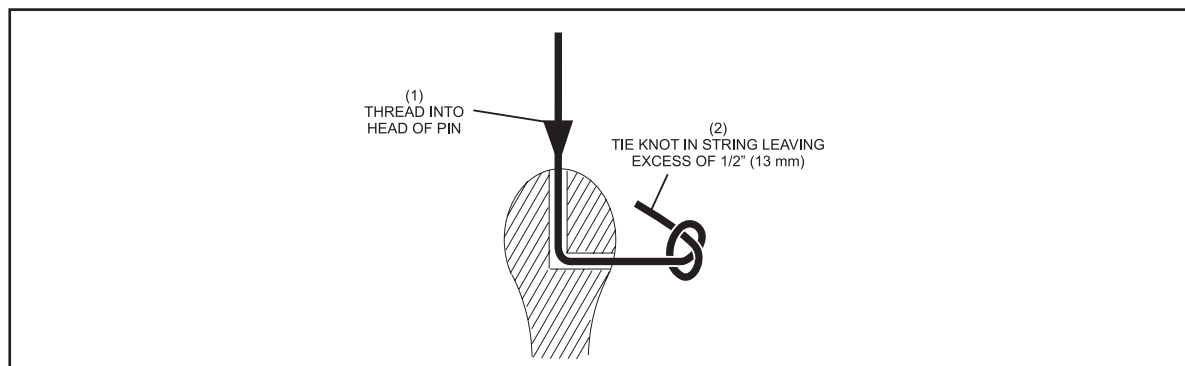


Figure 5-1. Thread String Through Pin

(1) THREAD STRING INTO
HEAD OF PIN

(2) TIE THE KNOT IN STRING
LEAVING EXCESS OF 1/2" (13 mm)

5. Pull the string back through the pin until the knot bottoms out in the pin. Refer to *Figure 5-1*.
6. Perform the String Tension Adjustment for any pin where the string has been repaired.

Installing New String

When installing new string it is important to make sure the strings are routed through the machine properly. Pay particular attention to how the strings are routed around the String Limiting Bar. The strings for pins 4, 6, and 7-10 go over the limiting bar. The strings for pins 1-3 and 5 route under the limiting bar. Refer to *Figure 5-2*.

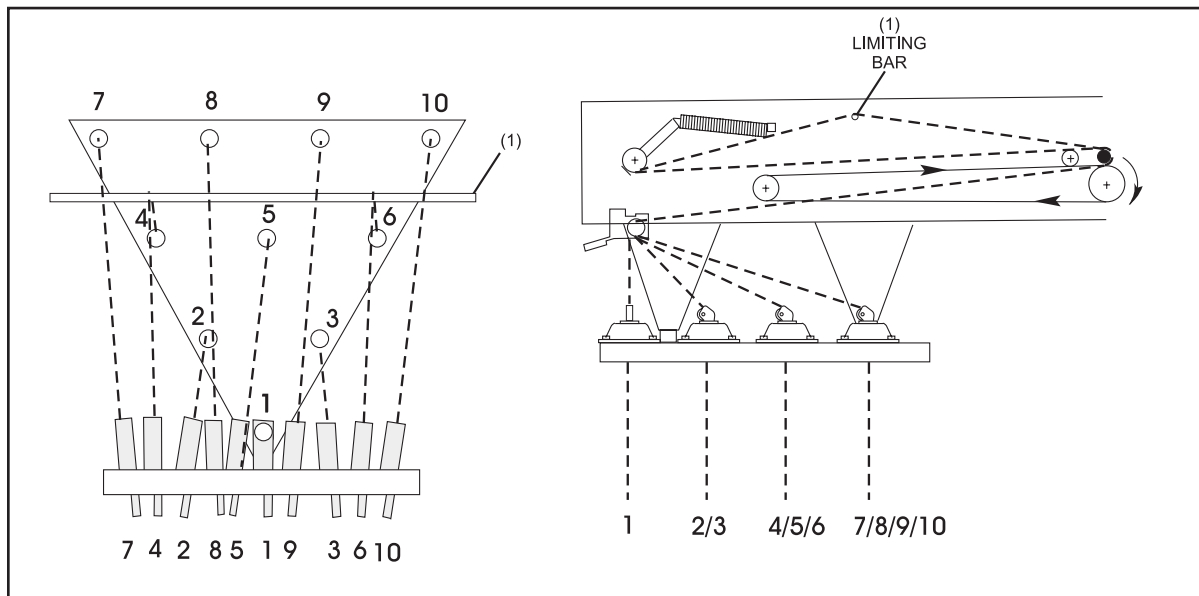


Figure 5-2. String Paths

(1) LIMITING BAR



Warning! Pinsetter power is to remain off while performing any manual function.



WARNING! To avoid burning your hands wear gloves and use a rag to taper the melted string end.

1. Cycle the pinsetter to first ball with ten pins on the pin deck.
2. Cut the string off any pin being replaced, just above its head. Refer to *Figure 5-3*.

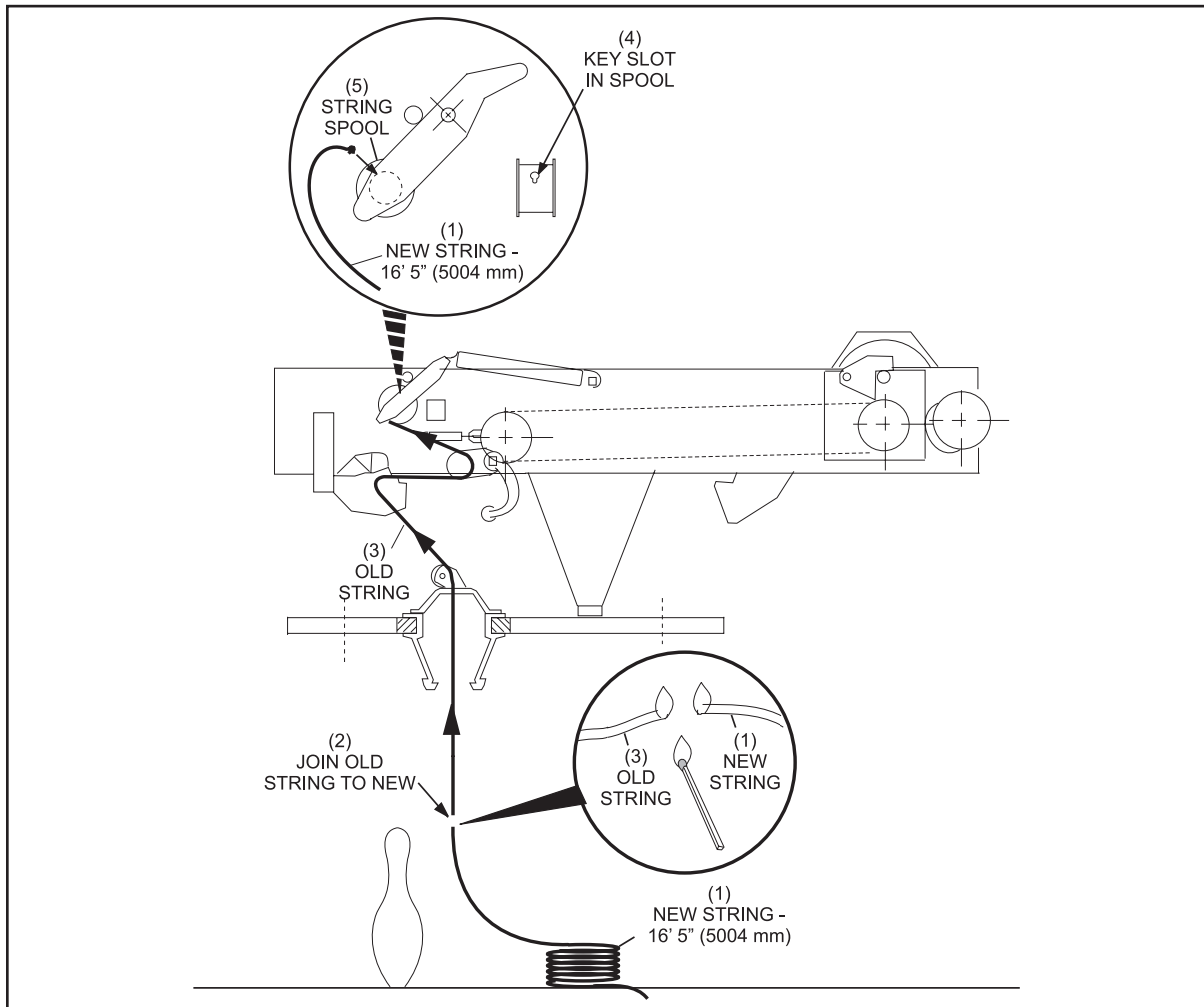


Figure 5-3. Restrung Machine

- (1) NEW STRING - 16' 5" (5004 mm) (2) JOIN OLD STRING TO NEW (3) OLD STRING
(4) KEY SLOT IN SPOOL (5) STRING SPOOL

3. From a spool of replacement string, cut off a piece 16' 5" (5004 mm) long for each pin having its string replaced.
4. At the cut end of the old string and one end of the new string melt the ends of the strings. While the string ends are still hot, press them together and hold until they cool and form a joint. Cover the joint with electrical tape to increase its strength. Refer to *Figure 5-3*.
5. At the String Spool, use the old string to carefully pull the new string through the machine until the new string is at the string spool. Remove the tape at the joint between the old and the new string. Cut off and discard the old string. Refer to *Figure 5-3*.
6. Remove the old string from the spool. Tie a knot in the end of the new string. Slide the knot through the key slot in the spool shaft and secure it. Refer to *Figure 5-3*.

7. At the pin end of the new string, thread the string through the head of the pin and tie a knot in the end of the string. Leave approximately 1/2" (13 mm) of string extending beyond the end of the knot. Refer to *Figure 5-1*.
8. Pull the string back through the pin until the knot bottoms out in the pin. Refer to *Figure 5-1*.
9. Wind the extra string onto the spool by rotating the spool as arrow (3) shows in *Figure 5-3*.
10. Adjust the spring tension for each new string, following the String Tension Adjustment.

MOTOR REPLACEMENT

Pinsetter Drive Motor

Motor Pulley

The single pulley used on drive motor can be used with both 50 and 60 cycle (Hz) power. For 60Hz operation use the smaller pulley, for 50Hz operation use the larger pulley.

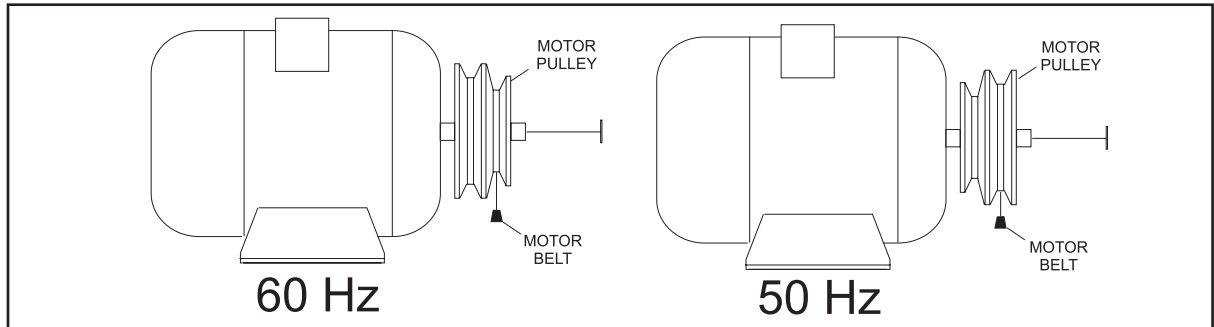


Figure 5-4. Motor Pulley

(1) 60 CYCLE SIDE

(2) 50 CYCLE SIDE

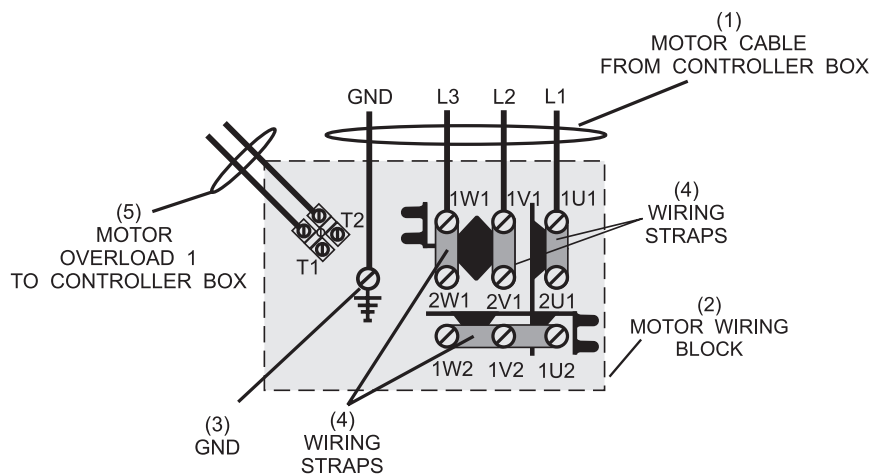
Motor Pulley Removal

1. Loosen the pulley's set screw with a 3 mm Allen wrench (hex key).
2. Use a gear puller to slide the pulley off the shaft. Save the key for use during installation.

Motor Pulley Installation

1. Make certain the key is properly seated in the motor shaft.
2. Place the pulley on the shaft with the desired orientation. Tap the pulley onto the shaft with a soft faced hammer.
3. Align the pulley so that the "V" belt will ride in the center of the motor pulley and the large drive pulley.
4. Tighten the set screw to prevent the motor pulley from moving out of position.

(6)
PINSETTER MOTOR WIRING FOR
208 TO 230 VOLTS



(7)
PINSETTER MOTOR WIRING FOR
380 TO 460 VOLTS

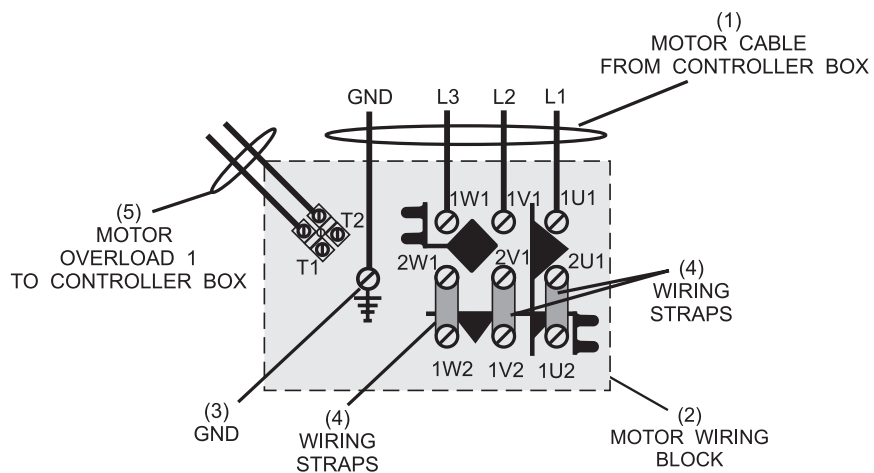


Figure 5-5. Drive Motor Wiring.

- | | | |
|--------------------------------------|------------------------|---|
| (1) MOTOR CABLE FROM CONTROLLER BOX | (2) MOTOR WIRING BLOCK | (3) GROUND |
| (4) WIRING STRAPS | (5) GROUND CONNECTION | (6) DRIVE MOTOR WIRING FOR 208 TO 230 VOLTS |
| (7) DRIVE MOTOR WIRING FOR 380 VOLTS | | |

Motor Rotation

1. Make sure wagon is off the stop dogs. Cycle power to make sure motor/wagon is turning in the correct direction.

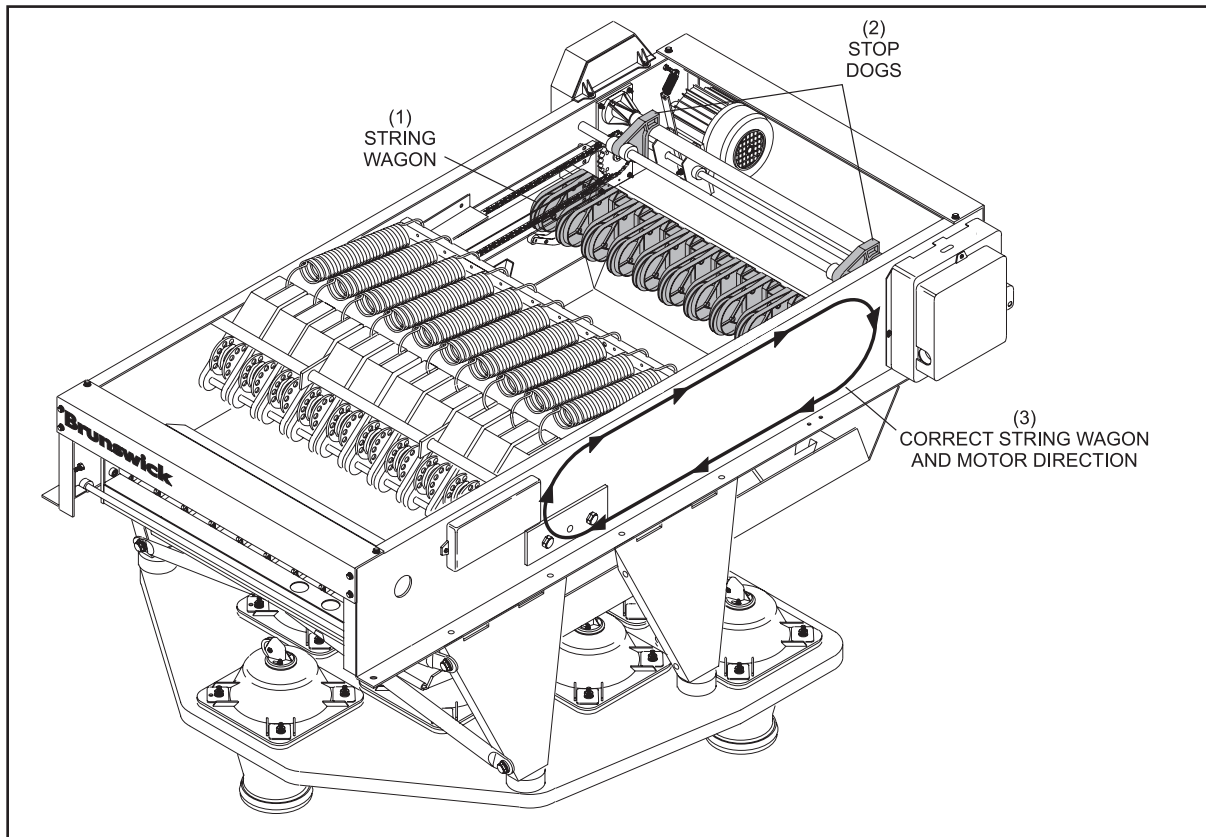


Figure 5-6. Correct Wagon Rotation Direction

(1) STRING WAGON

(2) STOP DOGS

(3) CORRECT STRING WAGON AND
MOTOR DIRECTION



Warning!: Make sure the wagon is off the stop dogs when testing the motor direction. Until the motor direction is correct do not have the wagon come in contact with the stop dogs or mechanical failure could occur.

Ball Accelerator Motor

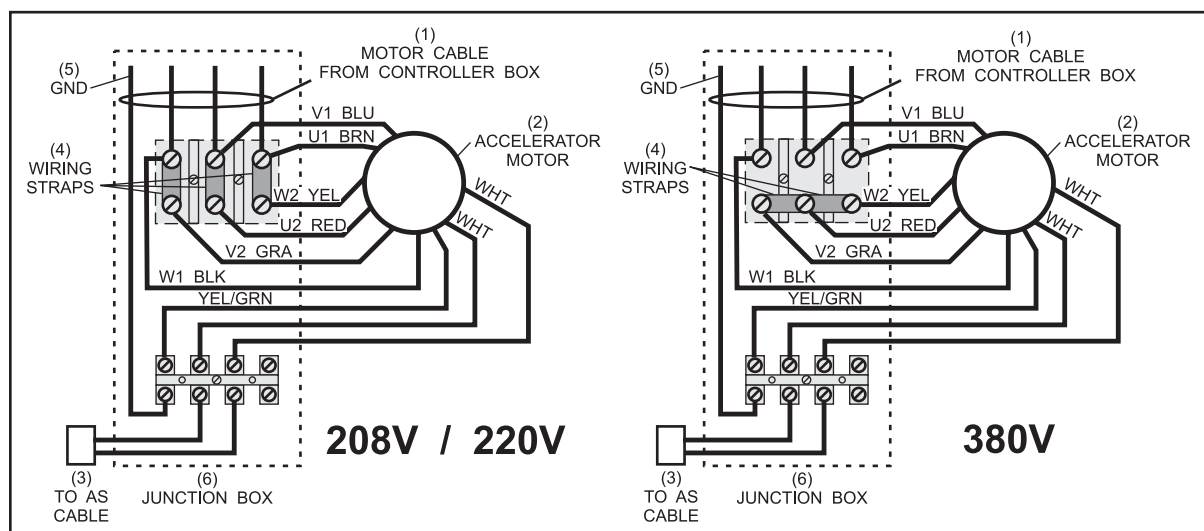


Figure 5-7. Accelerator Motor Wiring.

- | | | |
|-------------------------------------|-----------------------|------------------|
| (1) MOTOR CABLE FROM CONTROLLER BOX | (2) ACCELERATOR MOTOR | (3) TO AS CABLE |
| (4) WIRING STRAPS | (5) GROUND | (6) JUNCTION BOX |

- Turn the pinsetter on briefly and watch the rotation of the motor. Verify that the large belt will propel the ball forward.

If a motor is running backward, swap any two of the three supply wires from the Controller box at the motor terminal block. This will reverse the direction of the motor shaft.



WARNING: Never swap the ground (earth) wire with one of the supply wires.

LUBRICATION

Routine

Regular lubrication of the machine is necessary for a long machine life and good performance. The interval should be appropriate for the amount the machine is used. The more the machine is used, the more frequently it should be serviced.

- Every moving machine part should be lubricated from time to time.
- Every working part such as drive gears and drive chains, require more maintenance than low load parts.
- For large parts such as drive gears and chain sprockets, grease is the best lubricant
- For small parts, oil should be used.

Weekly (Every Week)

Rotating Pins

 **NOTE:** Pins should be inspected ounce a week.

Rotating pins in the 1 through 10 positions is necessary for long life of bowling pins .The rotation sequence of the bowling pins will depend on the bowling center and bowlers.

Pin Strings

Pin String Inspection and Repairing Worn String

 **NOTE:** Strings should be inspected at least once a week.

Check the strings for wear, paying particular attention to the area at the head of the pin. If worn, remove the section of string by performing the following steps:.



WARNING! To avoid burning your hands wear gloves and use a rag to taper the melted string end.

Quarterly (3 Month)

- Apply grease to the chain with a paint brush to lubricate the chain's exterior. Refer to *Figure 5-8*
- Lubricate the chain with oil. This oil will penetrate chain links to lubricate the chain's interior. Refer to *Figure 5-8*.
- Apply oil to the pivot point where the string wagon is attached to the chain. Refer to *Figure 5-8*.

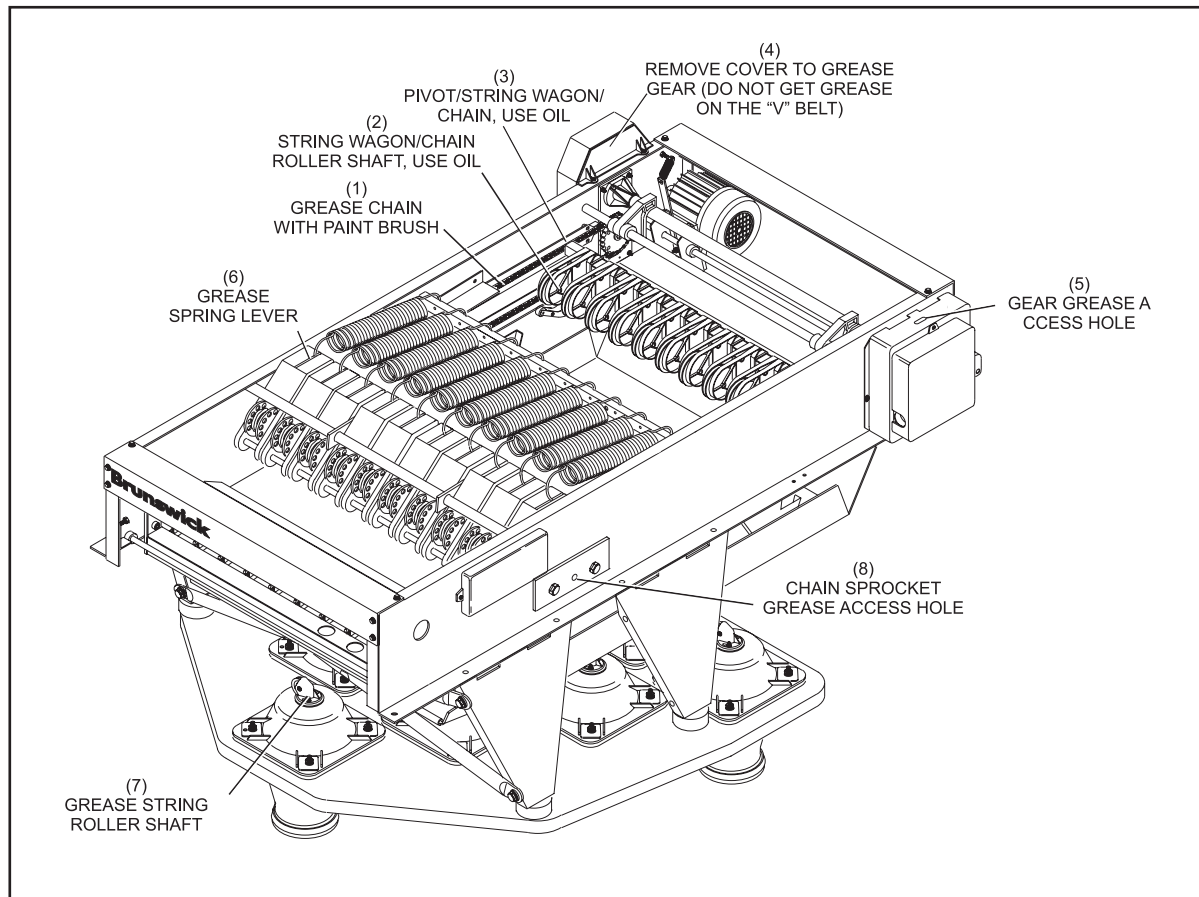


Figure 5-8. Lubrication Locations

- | | | |
|--|---|---|
| (1) GREASE CHAIN WITH
PAINT BRUSH | (2) STRING WAGON / CHAIN
ROLLER SHAFT, USE OIL | (3) PIVOT / STRING WAGON / CHAIN
USE OIL |
| (4) REMOVE COVER TO GREASE
GEAR (BE CAREFUL NOT TO
GET GREASE ON THE "V" BELT) | (5) GEAR, GREASE ACCESS
HOLE | (6) GREASE SPRING LEVER |
| (7) GREASE STRING ROLLER SHAFT | (8) CHAIN SPROCKET, GREASE ACCESS HOLE | |

Semi Annually (6 Month)

- Grease through hole in switch cluster over located on the right side of the rear of the pinsetter. Refer to *Figure 5-8*.
- Remove cover from the motor and gear assembly located on the left side of the rear of the machine and grease gear. Refer to *Figure 5-8*.
- Press grease in chain gears through hole in plate located on the outside of pinsetter frame adjacent to gear. Refer to *Figure 5-8*.

Annually

- Apply grease to the string roller shaft. Refer to *Figure 5-9*.

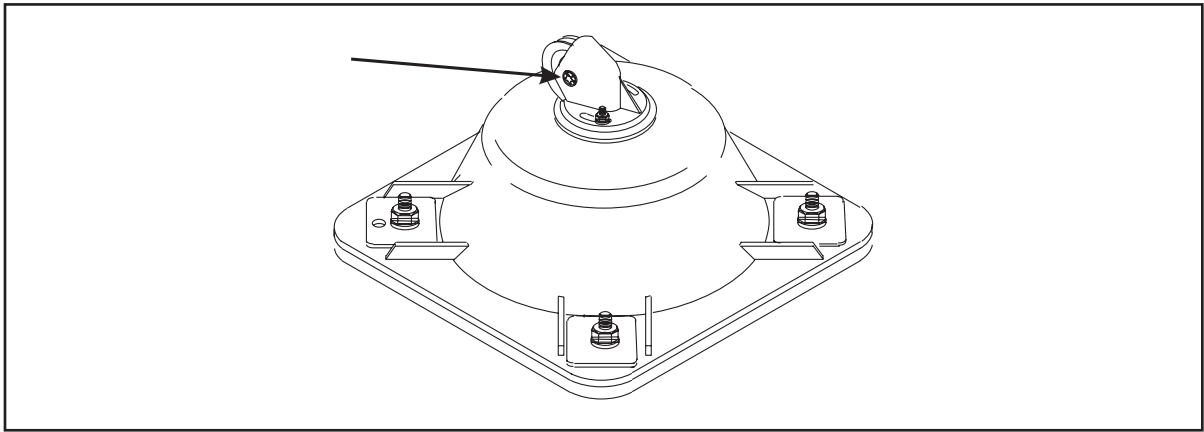


Figure 5-9. Grease String Roller

- Apply grease to the string lever with a paint brush. Refer to *Figure 5-10*.
- Apply a drop of oil on each side of the string lever. Refer to *Figure 5-10*.

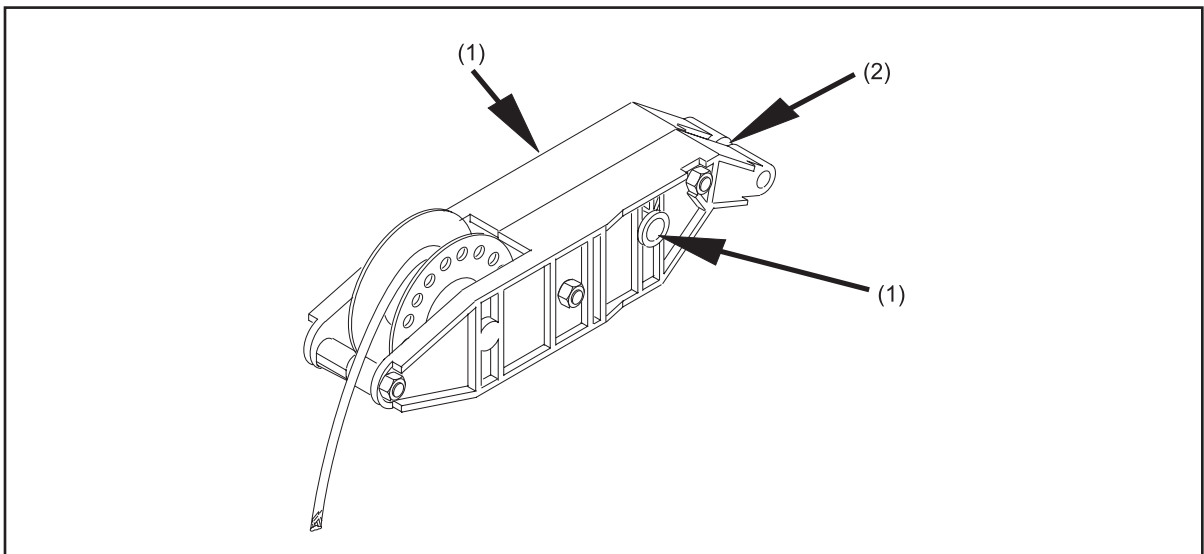


Figure 5-10. Grease String Lever With Paint Brush

(1) OIL

(2) GREASE

- Apply a drop of oil on each side of the string control units. Refer to *Figure 5-11*.

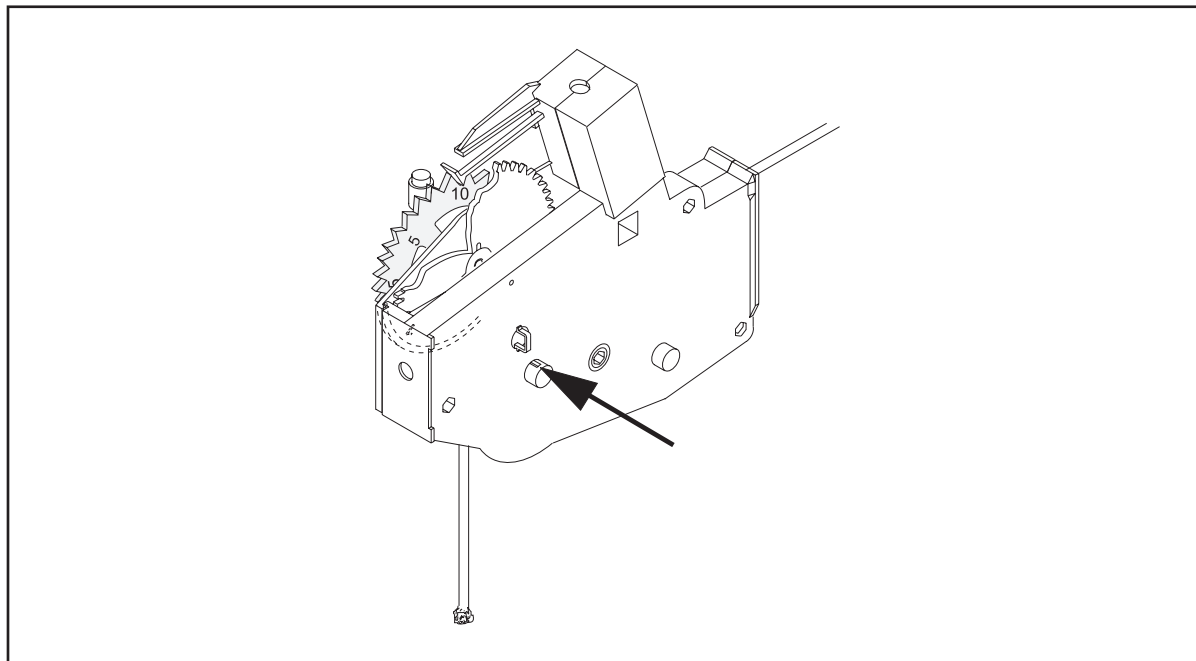


Figure 5-11. Oil String Control Unit

- Apply grease to the string wagon roller shaft and a drop of oil between the string wagon roller and the string wagon housings. Refer to *Figure 5-12*.

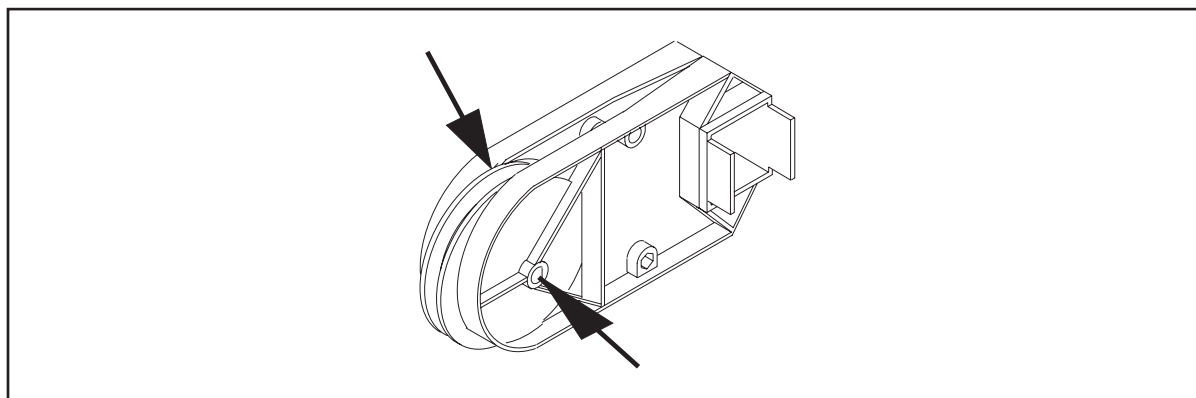


Figure 5-12. Oil & Grease String Wagon

Section 6 - Troubleshooting

Solutions to Common Problems

1. Machine and Accelerator Will Not Run

1. Check to see that the main switch is in the ON position.
2. Make sure the power cord is properly installed.
3. Check to ensure that the circuit breaker for the incoming power is not tripped or turned off.

2. One Machine Does Not Run

1. Make sure the motor stop switch on the Pinsetter for the non-running motor is turned ON.
2. Check to confirm that all electrical cables are properly installed.
3. Check to confirm that the de-tangle switch (under the red cover at the front of the right hand pinsetter side frame) is in the closed position.
4. Make sure the “V” belt for the drive motor is not off the pulley or broken.

3. Accelerator Will Not Run

1. Check the overload for the accelerator motor to make sure it is not tripped.

4. Machine Will Not Stop After Completing a Cycle

1. Make sure the ball detect light is on.
2. Check to see that the pinsetter ball detect is clean and properly adjusted.
3. Check the pinsetter ball detect cable. This can be done by switching the cables with the other machine on that pair of lanes.
4. Check the magnet on the SPIC to verify it is not stuck in line with the reed switch.

5. Machine Starts and Stops When Attempting to Lift Pins

1. Make sure there are not any pins or strings that are caught or not moving freely.
2. One or more pin strings have excessive spring tension.
3. Improper spring tension on the pinsetter motor.
4. A replacement string has been improperly installed.
5. Watch the de-tangle switch to see if its actuator is functioning improperly.
6. Check de-tangle switch wiring.

6. Machine Cycles and All Down Pins are Recognized by the Scorer. The Pinsetter Respots One or More of the Fallen Pins.

1. Check to see that the solenoid that locks knocked over pins in the up position is functioning.
2. Check to make sure all pins are properly routed and free to move.

7. After First Ball, the Head Pin is Bottomed Out on Centering Cone Instead of Having a Gap of Approximately 80 mm

1. Open the string break manually and adjust the string tension (increase the length of the string).
2. Make sure the string of the affected pin moves freely.
3. Make sure that the string brake solenoid is not constantly actuated.

8. A Machine is Malfunctioning But You Cannot Isolate the Problem

1. To determine if the problem is in the electrical box or with the machine, exchange the electrical boxes with those of a pair that are working properly.
2. If the problem follows the electrical boxes, exchange the control unit boxes. This should allow you to determine which of the boxes is causing the problem.

9. Pins Fall When Being Spotted or are not Respotted Accurately

1. Check to see that the strings of the pin or pins being spotted are properly tensioned.
2. Check the adjustment of slow setting brackets.
3. Check the location of the pin centering rings.
4. Check the centering plate for a broken rubber bumper.

Overview

StringPin Pinsetter Service Manual

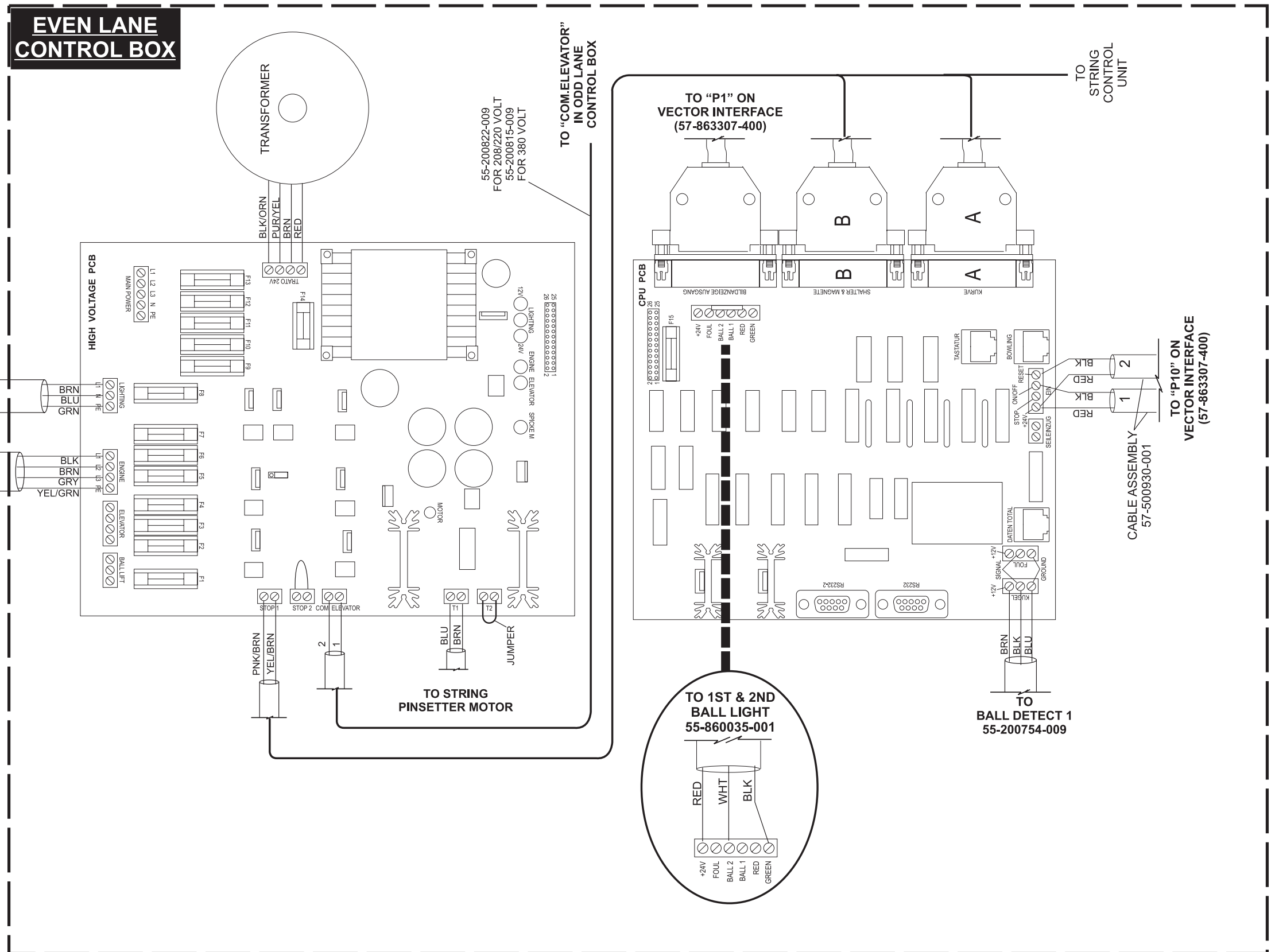


Figure 7-2. Even Lane Electrical Control Box

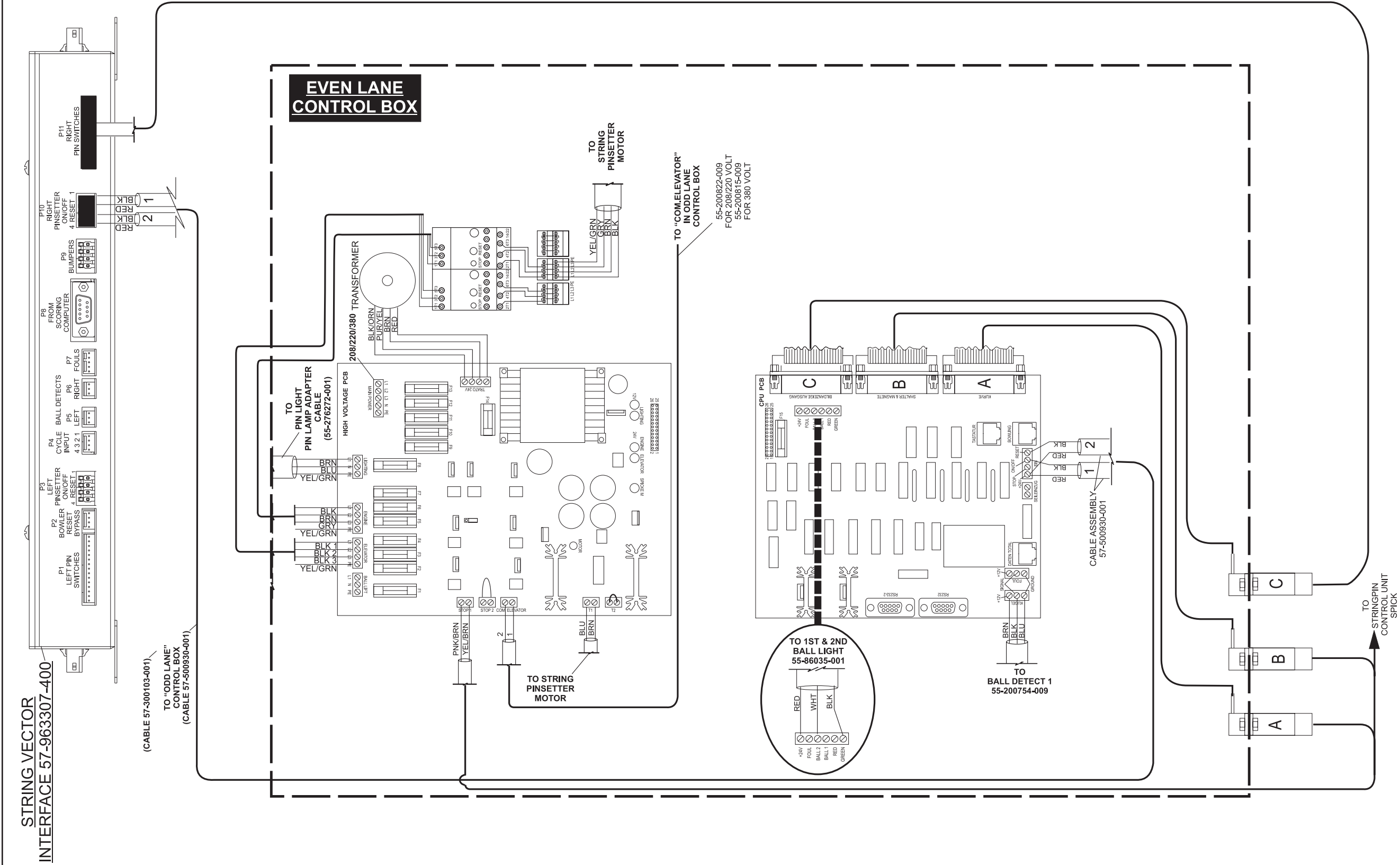
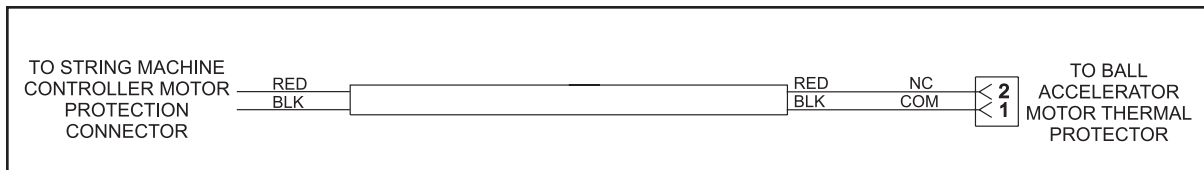
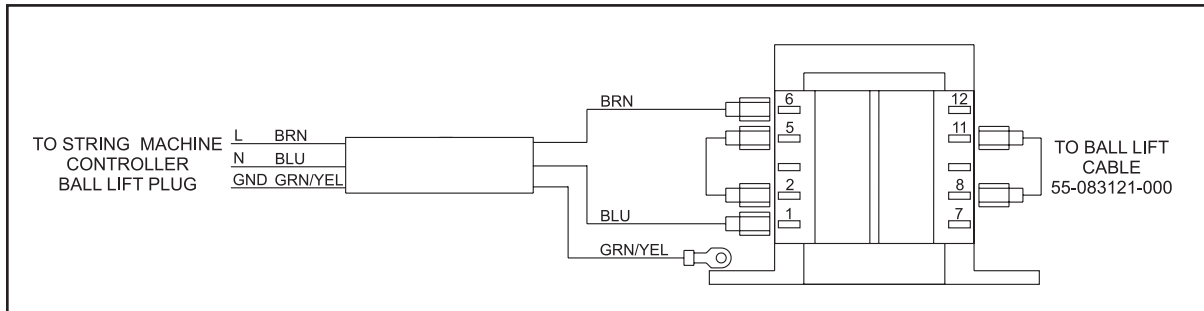


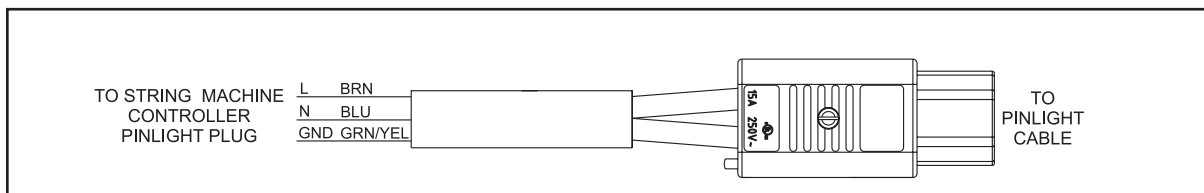
Figure 7-4. Even Lane "UL" Electrical Control Box



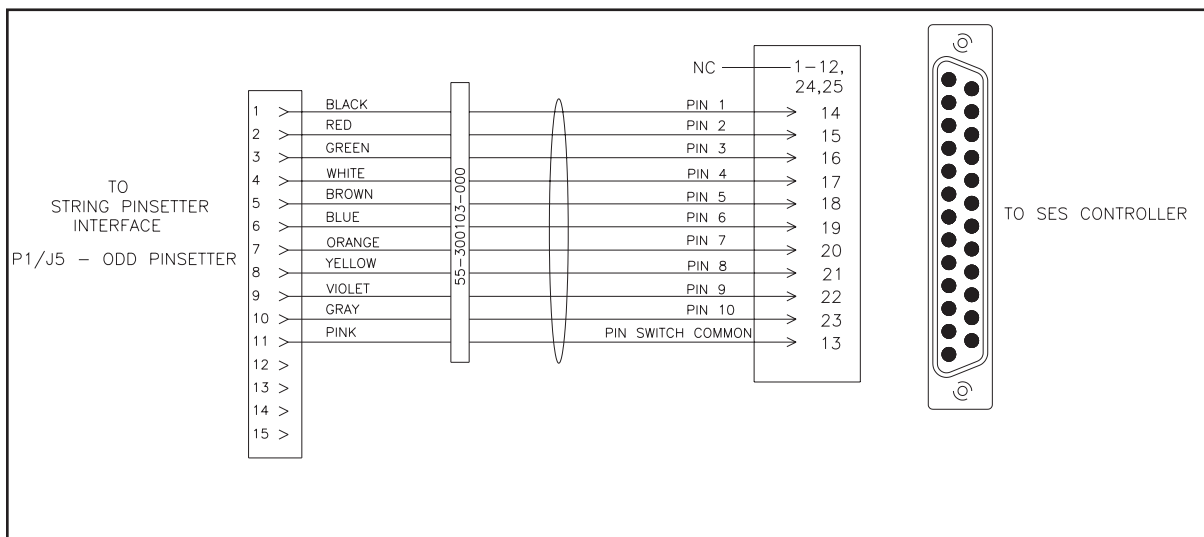
Ball Accelerator Motor Protection Cable Assembly (P/N 55-083119-001)



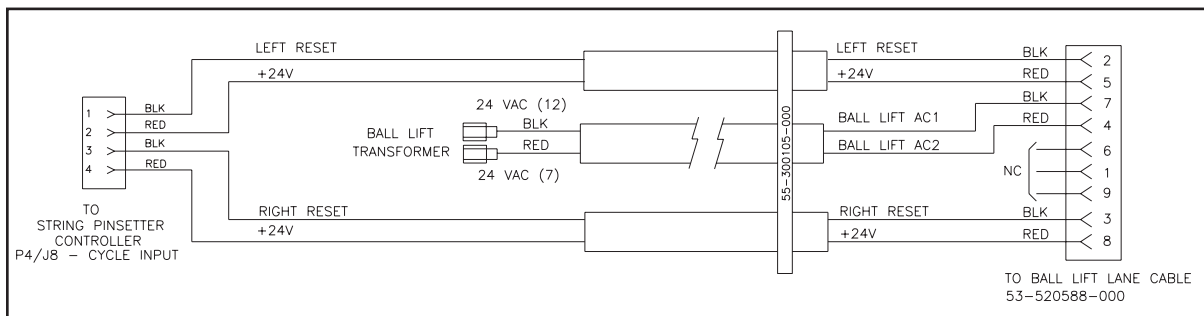
Ball Lift Power Transformer Cable Assembly (55-860030-001)



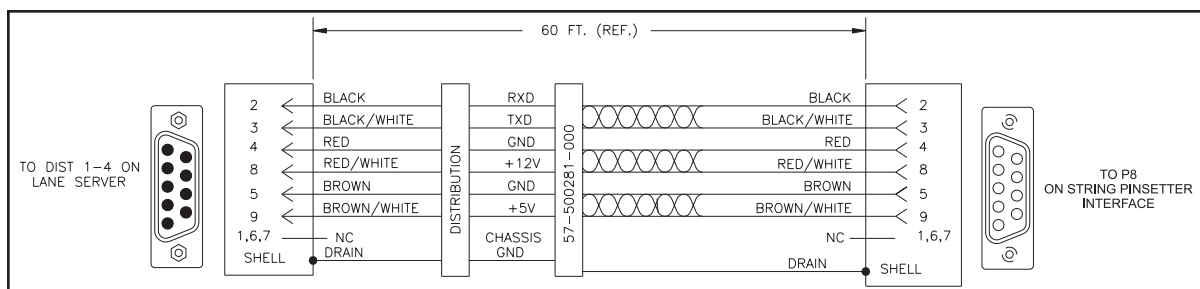
Pinlight Adapter Cable Assembly (P/N 55-276272-001)



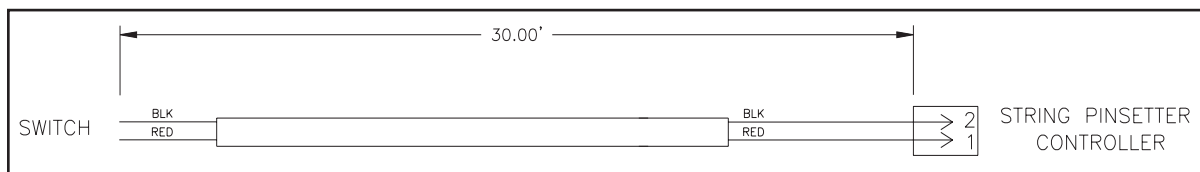
Pin Input, Odd Cable Assembly (P/N 55-300103-001)



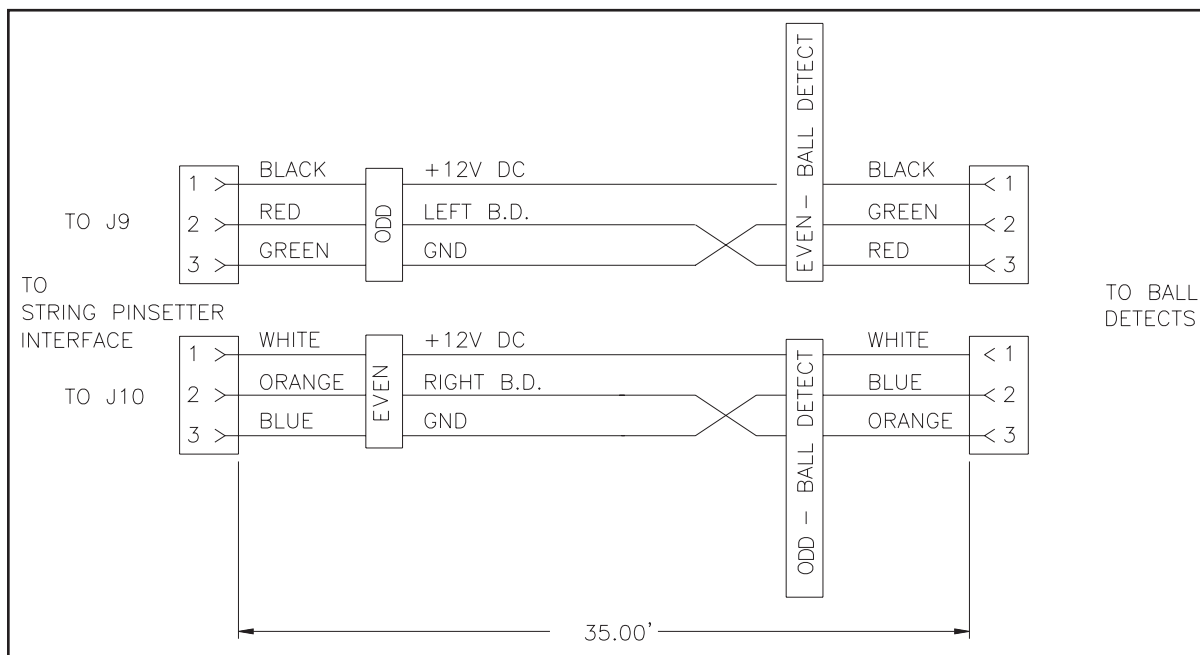
Ball Lift Control/Resets Cable Assembly (P/N 55-300105-001)



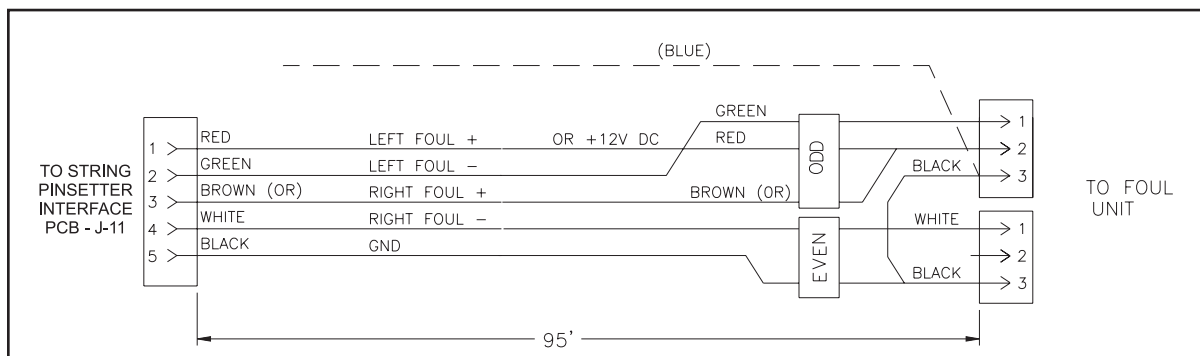
Scanner Data - Cable Assembly (P/N 57-500451-000)



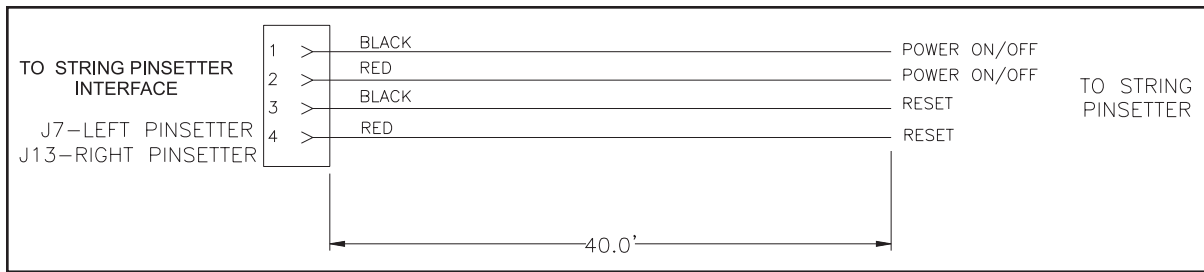
Remote Ball Detect On/Off Switch - Cable Assembly (P/N 57-500925-000)



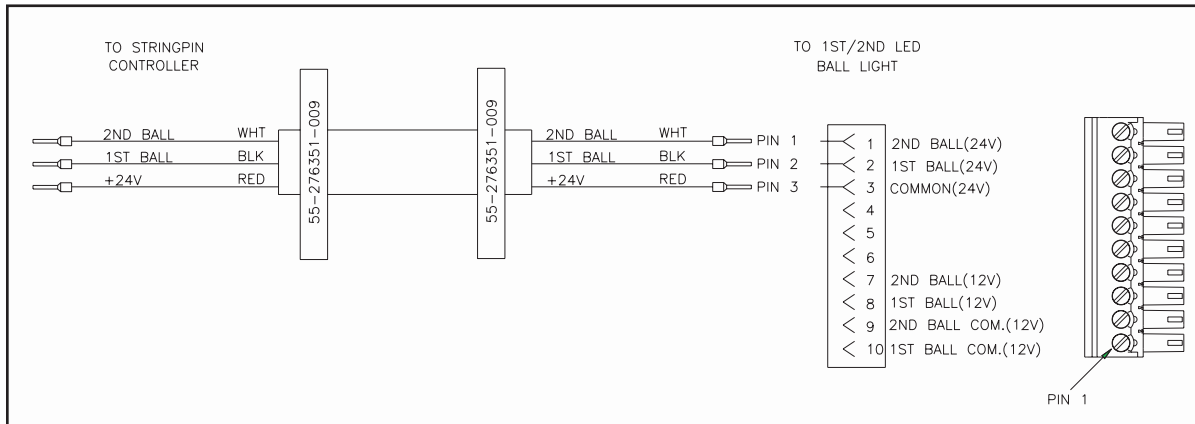
Ball Detect - Cable Assembly (P/N 57-500926-001)



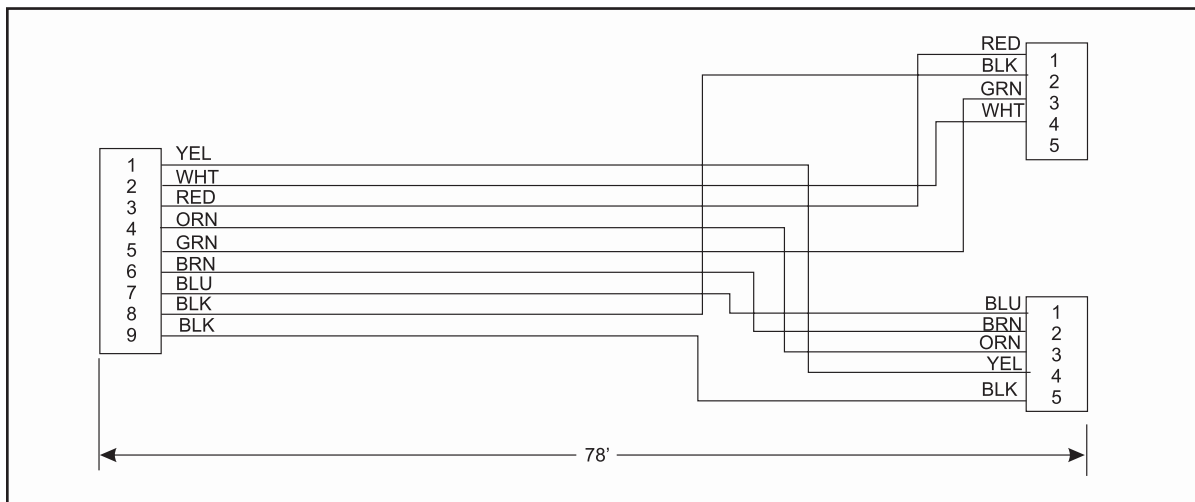
String Pinsetter Foul - Cable Assembly (57-500928-000)



On/Off Reset - Cable Assembly (P/N 57-500930-001)



1st & 2nd Ball Light LED String Machine Cable Assembly (55-860035-001)



Lane Cable, Ball Rack to A/P Control Cable Assembly (53-860691-000)